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EDUCATIONAL SERIES
EDITED BY
MARTIN G. BRUMBAUGH, A.M., PH.D.

THINKING AND LEARNING TO THINK

N. C. SCHAEFFER, PH.D., LL.D.

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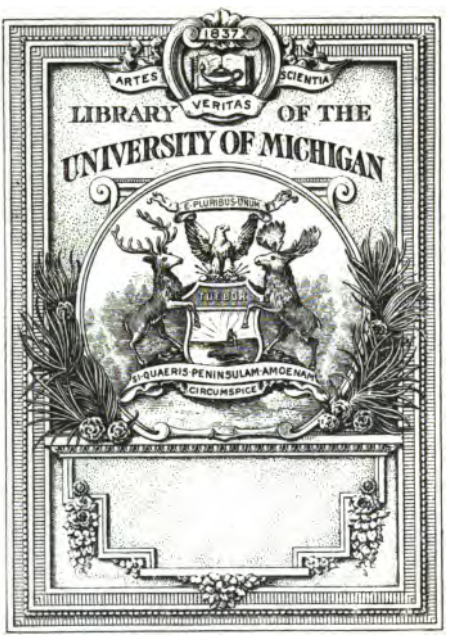

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LIPPINCOTT'S

EDUCATIONAL SERIES

EDITED BY

MARTIN G. BRUMBAUGH, A.M., PH.D.

PROFESSOR OF PEDAGOGY, UNIVERSITY OF PENNSYLVANIA, AND COMMISSIONER OF EDUCATION FOR PUERTO RICO

VOLUME I

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LIPPINCOTT'S EDUCATIONAL SERIES

THINKING

AND

LEARNING TO THINK

105727

BY

NATHAN C. SCHAEFFER, PH.D., LL.D.

SUPERINTENDENT OF PUBLIC INSTRUCTION FOR
THE STATE OF PENNSYLVANIA

PHILADELPHIA
J. B. LIPPINCOTT COMPANY
1901

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EDITOR'S PREFACE

THE progress of educational thought during the closing years of this century has been marvellous. Professional schools have created a demand for professional teaching by giving an increasing group of skilled instructors to our schools. This professional activity has caused our leading cities to provide training-schools, as integral parts of the city system of education. Finally, our great universities have established departments of pedagogy for the higher training in education. As a result, the leading positions in higher schools and in supervision are more and more demanding professionally trained leaders.

In this auspicious awakening for professional leadership there has come an increasing demand for standard treatises upon the fundamental problems of education. Treatises upon the history, methods, principles, and systems of education have appeared with astonishing frequency. That many of these are commercial treatises —made to sell—is doubtless true. There is always a great temptation to profit by an active demand. Well-disposed but not always widely trained and broadly cultured teachers, who have achieved a local success with a method that owed its virtue to the personality of its author and not to its intrinsic worth, have been tempted into authorship. The wiser and nobler minds in the profession wait. The days of unrest and experimentation, breeding discord and confusion, have in part passed away, and the time has come when the products of all this divergent activity may be put to the test of clear analysis and adequate experience. This is especially

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true in the domains of historic and philosophic inquiry. In experimental activity, touching the problems of psychic life as related to its sensorium, much has been done in a tentative way. Much must yet be done to produce results of enduring significance.

This series of educational treatises is projected to give inquiring minds the best thought of our present professional life. Fundamental problems in education will be exhibited in the series from time to time by thoroughly trained leaders of extended experience. Teachers may confidently accept these as authoritative discussions of the cardinal questions of their profession.

The highest endowment of the human spirit on the intellectual side is the power to think. Learning to think is an essential process and end in all school work. Thinking is the intellect's regal activity. In a vague way, all teaching appeals to the thought-activity of the pupil; but vagueness in teaching is as pernicious as it is common. To exhibit the value, scope, and process of thought is of inestimable service to the teacher. It gives specific direction to teaching processes, and saves the child from a thousand fanciful expedients.

In the craze of the passing decade for novelty in teaching, there has resulted an undue emphasis upon forms of so-called expressional activity. It has been, in many quarters, forgotten that education is noblest when it produces reflective activity. The power to analyze and synthetize thought-complexes is the most fruitful endowment of the intellectual life. Expression without adequate reflection is productive of superficiality.

We have been living a life of educational expedients. The path of educational advance is strewn with countless cast-off practices which once claimed attention largely because of the feeling among too many that the newest theory is the best. There has come, let us hope, the

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more rational resolve to test all new and loudly heralded theories by fundamental laws of mental activity. To emphasize the significance of this reaction, and to afford helpful criteria of educational processes, this volume will be found most stimulating, suggestive, and sensible.

For the purposes of the teacher thinking may be distinguished as follows:

(*a*) *Clear thinking*, by which one is to understand thinking the thing, and not some other thing in its stead. Much thinking is not clear. The power of recall is not fully developed. The mind acts, but is not able to assert confidently the accuracy of what it acts upon. Much needless criticism is heaped upon schools because pupils cannot spell correctly, solve problems accurately, recite a lesson in history or in geography properly,—in short, because the pupil's knowledge is not clear. The first step in all true teaching is the step that makes clear to the pupil the thing he is to think.

(*b*) *Distinct thinking*, by which one is to understand thinking the thing in its relations. This phase of thinking is sometimes called apperception. It is the second, and not the first step in thinking. There is no value in teaching relations until the things to be related are first clearly apprehended. Perception must precede apperception. The pupil in the elementary school has been well taught if he has been taught to think clearly and distinctly.

(*c*) *Adequate thinking*, by which one is to understand thinking the thing in its essential parts. This is the analytic form of thought. The child at first cannot think adequately. His mind thinks things as wholes. He has not the power to think the whole and its parts, as parts of the whole, simultaneously. He must rise to adequate thinking only after clear and distinct thinking have become habits of mind. The fuller phase of this activity, by which these analyzed parts are synthetically

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wrought into an organic unity, is the process of concept-making,—the essential prerequisite of all high orders of thought. This power every teacher should possess. It is his surplus of knowledge, the possession of which makes him easily master in the teaching process.

(*d*) *Exhaustive thinking*, by which one is to understand thinking the thing in its causes. This is the highest form of thinking the thing. It gives perspective to thought-processes, and eliminates all accidental and misleading elements from the categories of thought. To achieve this, one must specialize. The teaching of the future must be more and more intensive in scope. The day of the encyclopædist is gone. The teacher of to-morrow must be a teacher who knows one order of truth exhaustively, and who possesses the skill to incite in others a permanent enthusiasm for that order of truth. Scientific progress is conditioned by such teaching.

The author has brought to this discussion the matured convictions of broad training in American and European systems of schools, and a wide and successful experience in teaching pupils and directing systems of education. The discussion takes on the modest but stimulating style of the public speaker. The author has for many years been among our foremost lecturers upon education. The temper of the discussion is moderate and constructive. There will be found here no wild excess, no straining after fanciful effect, no advocacy of sensational and ephemeral methods; nor is there a trace of pessimistic and destructive criticism of the earnest teachers who are conscious of limitations and are reaching hopefully for help. On the contrary, the discussion is full of real sympathy, founded upon personal experience with teaching in all its phases, and abounds in stimulating suggestion.

M. G. B.

October 1, 1900.

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PREFACE

FOR a number of years it has been the author's duty as well as privilege to lecture at county institutes on the difficult art of teaching pupils to think. This led to the request that the lectures be thrown into permanent form for publication. The lecturer who never publishes has no pet theories to defend; he can change his views as often as he sees fit; yet, in spite of this advantage, he cannot always escape or ignore the art of printing. One who gives his thoughts to the public without the use of manuscript and under the limitations of extemporaneous speech, made necessary by the large audiences which gather at teachers' institutes, especially in Pennsylvania, runs the risk of being misquoted and misunderstood; he pays the penalty of being reported in fragmentary if not distorted forms. This ultimately drives him, in justice to himself and others, to write out his theories on education and to give them to his coworkers in print.

Portions of these lectures were delivered at the annual meeting of the superintendents of New England, before the State teachers' associations of Massachusetts, Rhode Island, and Florida, before the Connecticut Council of Education, before the summer schools held under the auspices of the Ohio State University and the University of Wisconsin, and at several of the meetings of the National Educational Association. The favorable hearing accorded on these occasions induces the hope that the lectures will be kindly received by many who teach out-

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side of Pennsylvania, and by some who give instruction in our higher institutions of learning.

Although no one can hope, on so difficult a theme, to say much that will be entirely satisfactory to leading educators, surely no apology is needed from any one who, after spending his best years in educational work, attempts to contribute his mite towards the solution of any of the problems which confront the teacher.

It is assumed that there is a body of educational doctrine well established in the minds of teachers, and that on many school questions we have advanced beyond the border line of first discovery. Those who assert that our educational practice is radically wrong and in need of thorough reformation should hasten to clarify their own views and ideas, to substitute constructive for destructive criticism, and to give definite shape to their reforms; otherwise a whole generation will grow to maturity and the reformers themselves will pass away before any of their reforms will have been accomplished. To give teachers the feeling that what they are doing is all wrong, and to leave them without anything better in place of what is condemned, robs them of joy in their work, makes them victims of worry and neurasthenia, and unfits them for the care of children. It is hoped that these lectures will be found to suggest a better way whenever criticism is bestowed upon existing methods of instruction.

No attempt is made to ridicule the arm-chair psychologists, or the advocates of child study, or those patient and painstaking workers who are honestly seeking to establish the facts of mind through experiments in the laboratory. He who has carefully reflected upon the art of making pupils think will not hesitate to admit that thus far he has received more light from the standard psychology than from the labors of those who claim to be the exponents of the new psychology. The latter can hardly

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write or talk without using the terms coined by the older students of mind; this shows their indebtedness to those who taught and speculated before laboratories of psychology were established. Sometimes the experiments have only served to test and give a reason for what was already accepted. Often they have brought to our knowledge facts of mind which could never have been discovered by the method of introspection. In either case the experiments have resulted in clear gain. Let the facts of brain and mind, of nervous and mental action, of human growth, maturity, and decay be gathered, questioned, tested, and classified; let their bearing upon educational practice be set forth in the clearest possible light: every resulting step of progress and reform will be hailed with delight by all who have no pet theories to defend.

The lecturer is limited by time, by the kind of audience which he addresses, and by circumstances largely beyond his control. These limitations drop out when he reduces his thoughts to writing, and a rearrangement at many points becomes possible as well as desirable. The expedients for relieving the strain of attention and winning back the listless can be omitted; and omissions that become necessary through the exigencies of the programme must be supplied for the sake of logical sequence. Moreover, the aims which those who engage the lecturer set before him frequently require a modification of the line of discussion, so that a course of lectures on a specific theme cannot always follow the same order of treatment, although substantially the same in content and scope. Hence the division into chapters has been adopted as preferable to the original sequence of lectures. Nevertheless, the style of the rostrum has not been altogether eliminated, because when oral discourse is thrown into new forms, and the phraseology is changed for the sake

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of publication, the loss in vividness, directness, and simplicity is greater than the gain in diction and fulness of statement.

Lecturing, as well as book-making, has its peculiar temptations. The lecturer must interest his hearers in order to hold them; he is tempted to play to the galleries, and to omit what is beyond the comprehension of the average audience. The book-maker, on the other hand, is tempted to display his learning, to make a show of depth and erudition. The student of pedagogy is supposed to be in search of profound wisdom. Those who write for him often dive so deep that their style becomes muddy. Unfortunately, some of the best treatises on education have been written in the style of the philosopher and wrought out on the plane of the university professor, although intended for undergraduates at normal schools, and for teachers whose meagre salaries do not enable them to pursue courses of study at institutions of higher learning. The lucid style of Spencer's treatise on "Education" has done much to counteract this tendency. Yet many of the authors of our treatises on pedagogy seem to be haunted by a feeling similar to that of the German professor, who, on reading the opening chapters of a new book, and finding them to be intelligible to his colleagues, exclaimed, "Then I must rewrite these chapters; otherwise nobody will read my book through."

Huxley has well described the penalty which must be paid by those who speak or write for the purpose of being understood. These are his words:

"At the same time it must be admitted that the popularization of science, whether by lecture or essay, has its drawbacks. Success in this department has its perils for those who succeed. The 'people who fail' take their revenge, as we have recently had occasion to observe, by ignoring all the rest of a man's work and glibly labelling

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him a mere popularizer. If the falsehood were not too glaring, they would say the same of Faraday and Helmholtz and Kelvin."

One who can never hope to rival the style of Spencer and Huxley and those to whom the latter refers, will nevertheless do well to emulate their skill in making difficult things plain to people who are not specialists or experts. He who writes for the teachers in our public schools should put aside his ambition to be considered erudite or profound, and endeavor above all things to be understood. Vague theories are apt to beget a bad conscience in those who teach and to destroy the joy which every one has a right to feel while doing honest and faithful work. Hence the writer offers no apology for heaping illustration upon illustration in the effort to make his meaning plain to those whom he aims to help.

There is at present great need for clear thinking and luminous presentation of facts on the part of all who write on education for the people or for teachers in our public schools. By a process similar to that by which the mediæval imagination swelled the murder of the innocents at Bethlehem into a slaughter of thousands of children (there cannot have been many male children two years old and under in a small Judean village), the harm which some pupils suffer is magnified into a national crime at the feet of American parents; the evils which result from "Bob White" societies, from children's parties, from church sociables for young boys and girls, are all ascribed to the school curriculum; and reforms in home study are proposed which never fail to provoke a smile on the face of a healthy boy.

The hygienic conditions of the average school are quite equal to those of the average home. The health of many children improves during their attendance at school. The pupils who are born with a sound mind

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in a sound body, who get healthful diet, enough sleep, and treatment from their elders which is not calculated to make them nervous or unhappy, show none of the illness from overwork, the dulness of brain from fatigue, and the exhaustion of nervous energy which are made to furnish the narrow basis of fact for vague and broad generalizations. The haze in which those who must furnish the printer a given amount of copy in a given time are apt to envelop whatever they write has an effect like that of misty air upon the size of visible objects. Travellers who have come into a cloud while ascending a mountain report that a small wood-pile then looks like a barn, a cow seems larger than an elephant, men appear as giants, and the surrounding heights assume threatening proportions. As soon as sunlight clears the atmosphere, objects are again seen in their true dimensions. The moment the light of common sense penetrates the haze and mist and fog and cloud which are used to heighten the effect of essays upon school work, the need of radical reform seems far less urgent; and teachers, instead of wasting their time in worry and uncertainty, begin with cheerful heart to impart that which modern civilization requires every child to know as a condition of bread-winning and complete living.

There is, of course, a worse fault than obscurity of style,—namely, dearth of ideas. The danger to which the lecturer is always exposed, that of losing his hearers and failing to be recalled (their minds may leave while they are bodily present), spurs to effort in two directions. Either he will try to say something worth listening to, or he will strive to entertain by amusing stories and incidents. If he be conscious of a lack of talent for humor, he will try to stuff his lectures full of sense. If the lectures here published lack in this respect, the writer is willing to acknowledge failure.

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In preparing a course of lectures it is proper to bear in mind the difference between the lecturer, the orator, the poet, and the philosopher. The philosopher investigates ideas and truths, explores their essence and relations, and unfolds them in their deepest unity and in their greatest possible compass. When this has been done throughout the whole domain of thought, his mission is accomplished. The poet seeks to clothe his ideas in beautiful forms. When the idea is perfectly suited to the form and the form to the idea, his mission is accomplished. The orator aims to move the will; he quotes authorities, uses ideas, appeals to the feelings, and subordinates everything to the one end of gaining a verdict, winning a vote, or getting a response in the conduct of those whom he addresses. The lecturer seeks to impart information. He aims to get a response in the thinking of those whom he addresses. He tries to reach the intellect rather than the will. Beautiful language and exhaustive treatment are not essential parts of his mission. It is his province to elucidate the theme under consideration, to guide the efforts and inquiries of those who come to him for instruction, to direct them to the sources of information, and to furnish such incentives as he can towards independent study and investigation.

Since the data for pedagogy are derived mainly from kindred fields of investigation, the lecturer on the science and art of education has frequent occasion to cite authorities and to utilize the labors and conclusions of the men eminent in the sciences which throw light upon the growth of the child, more especially upon the development of mind and character. The most original writers quote very little, and those who are anxious to establish a reputation for originality refrain from quoting others. It is the business of the lecturer to lead the hearer to the sources of information. When

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anything has been so well said that he cannot improve upon the form of statement it is proper that he should quote the language, carefully giving the source whence it is derived. Without doubt, when the genius appears who will do for pedagogy what Aristotle did for logic and Euclid for geometry, he will so polish every gem he gets from others and give it a setting so unique and appropriate that the world will recognize the touch of the master and acknowledge the contribution as peculiarly his own handiwork. In painting and sculpture we look to the past for the greatest works of art. In music the century now closing has rivalled, if not surpassed, its predecessors. In the science and art of education the greatest achievements belong to the future. It is currently reported and sometimes believed that when the president of a celebrated university was asked why he had transferred a certain professor from the department of geology to that of pedagogy, he replied, "I thought the fellow would do less harm in that department." If the story is not a myth, he probably meant less harm to the reputation of the university. When in our day a course in geology or logic or geometry is announced, one can foretell the ground that will be covered. No such prediction can be made with reference to a course of lectures on teaching. The prophet is yet to come who will fix the scope of the science of education and give it something like definite and abiding shape.

This volume is not designed to supplant systematic treatises on psychology and logic. Its aim is to throw light upon one important phase of the art of teaching. If it contributes but two mites to the treasury of information on the science and art of education, the labor bestowed upon it has not been in vain. Should any critic hint that two mites are all one has to give, it may be said in reply that it is better to give something than to give

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nothing at all, and that according to Holy Writ the smallest contributions are not to be despised if made in the right spirit. And it may add to the critic's stock of ideas to be informed that a small English weight, called mite, outweighs very many of the current criticisms upon modern education, that of this small weight it takes twenty to make a grain, and that to a faithful teacher a tenth of a grain of helpful suggestion is worth more than many tons of destructive criticism.

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I

MAKE THE PUPILS THINK

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The value of a thought cannot be told.

BAILEY.

He who will not reason is a bigot; he who cannot is a fool; he who dares not is a slave.

BYRON.

Reason is the glory of human nature, and one of the chief eminences whereby we are raised above the beasts in this lower world.

WATTS.

Man is not the prince of creatures,
But in reason. Fail that, he is worse
Than horse, or dog, or beast of wilderness.

FIELD.

Man is a thinking being, whether he will or no. All he can do is to turn his thoughts the best way.

SIR W. TEMPLE.

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I

MAKE THE PUPILS THINK

For the purpose of testing the quality of gold alloy jewellers formerly used a fine-grained dark stone, called the touchstone. In the eyes of an educator good instruction is more precious than pure gold. The touchstone by which he tests the quality of instruction, so as to distinguish genuine teaching from its counterfeit, rote teaching, is thinking. The schoolmaster who teaches by rote is satisfied if the pupils repeat his words or those of the book; the true teacher sees to it that the pupils think the thoughts which the words convey.

A test of teaching.

Thring, who, next to Arnold, was perhaps the greatest teacher England ever had, laid much stress upon thinking. Sometimes he would startle a dull lad, in the midst of an exercise, by asking, "What have you got sticking up between your shoulders?" "My head," was the reply. "How does it differ from a turnip?" And by questioning he would elicit the answer, "The head thinks; the turnip does not."

Thring's practice.

So important is thinking in all teaching that at the World's Educational Congress, in 1893, one educator after another rose in his place to emphasize the maxim, "Make the pupils think." One of the most advanced of the reformers shouted in almost frantic tones, "Yes, make even the very babies think." After the wise men had returned to their homes, a Chicago periodical raised the query, "How can you stop a pupil from thinking?" And the conclusion it announced was

Views of others.

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that neither the teacher behind the desk nor the tyrant upon his throne can stop a pupil from thinking. Evidently, if that which sticks up between a boy's shoulders is a head and not a turnip, if the pupil is rational and not an imbecile or an idiot, he does some thinking for himself; and the maxim, "Make the pupils think," requires further analysis before it can be helpful in the art of teaching.

We who teach are very apt to overestimate thinking in our own line of work and to undervalue thinking outside of the school. There is, perhaps, as much good thought in a lady's bonnet as in the solution of a quadratic equation. A sewing-machine embodies as much genuine thought as the demonstration of a geometrical theorem. The construction of a locomotive or a railway bridge displays as much effective thinking as Hegel's "Philosophy of History," or Kant's "Critique of the Pure Reason." Most men think very well in doing their own kind of work; in many other spheres of activity they must let other people think for them. When the professor of astronomy discusses a problem connected with his science, he thinks for himself; but when he buys a piece of land, he gets a lawyer to think for him in the examination of the title and the preparation of the deed. The lawyer thinks for himself in the court-house; but when he goes home to dine, he expects his wife, or the cook, to have done the thinking for him in the preparation of the dinner. Grover Cleveland had the reputation of thinking for himself: many a politician found out that this reputation was founded on fact; but when the ex-President is sick, or has the toothache, he is willing to let a physician or a dentist think for him. In like manner, a pupil may think very well upon the play-ground; but if the teacher, whose very name indicates the function of guiding, fails to guide the pupil aright, the latter may

Thinking for one's self. Relying on others.

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become a mere parrot in the class-room. What, then, is involved in making a pupil think?

The difficulty in answering this question is increased by the diversity of meanings of the word *thinking*. The teacher who is not clear in his use of the term may employ exercises calculated to develop one kind of mental activity, and then accuse the pupils of dulness because they do not show facility in some other intellectual process. When a text-book on mental science defines the intellect as the power by which we think, the term *thinking* is used to designate every form of intellectual activity. The Century Dictionary defines thinking as an exercise of the cognitive faculties in any way not involving outward observation, or the passive reception of ideas from other minds. The logician defines thinking as the process of comparing two ideas through their relation to a third. Many exercises of the school are supposed to cultivate thinking in the last sense of the word, when in reality they cultivate thinking only in the widest acceptation of the term.

Thinking defined.

The writer saw a normal school principal conduct an exercise in thinking, as the latter called it. Turning to one of the pupils, he said, "Charley, will you please think of something?" As soon as the boy raised his hand the principal asked, "Does it belong to the animal, the vegetable, or the mineral kingdom?" Then turning to the other members of the class, he said, "Who of you can think of the vegetable in Charley's mind?" The names of at least forty different vegetables were given and spelled and written upon the black-board. At last a pupil succeeded in naming what was in Charley's mind. Then there was a look of triumph upon the faces of the principal and the class, as much as to say, "Isn't that splendid thinking?" At least one person felt like burying his face in his hands for very shame; for

A faulty exercise.

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here was resurrected from the dead an old exercise of philanthropinism which was buried more than a hundred years ago. What should one call that kind of mental activity? *Guessing*. That is all it is. The exercise tended to beget a habit very difficult to break up after it has been formed.

A better plan.

Far better was an exercise which the writer witnessed in a graded school. The teacher had called the class in the second reader. As soon as all the pupils were seated she said, "You may read the first paragraph." Instead of reading orally, the class became so quiet that one might have heard a pin drop. After most of the hands were raised she called upon one pupil to tell what the paragraph said. The second paragraph was read and the substance of it stated in the pupil's own words. An omission was supplied by another pupil; an incorrect phrase was modified by giving the correct words for conveying the thought. In the course of the lesson it became necessary to clarify the ideas of some. This was accomplished by a few pertinent questions which made the pupils think for themselves. After the entire lesson had been read in this way she dismissed the class without assigning a lesson. Every member of the class went to his seat, took out his slate, and began to write out the lesson in his own language. The interest and pleasure depicted on their faces showed that it was not a task but a joy to express thought by the pencil. The teacher had given them something to think about; she had taught them to express their thoughts in spoken and written language; her questions had stimulated their thinking, and when, later in the day, the lesson in oral reading was given, the vocal utterance showed that every pupil understood what he was reading. There was no parrot-like utterance of vocables, but an expression of thought based upon a thorough understanding and

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appreciation of what was read. The silent reading was an exercise in thought-getting and thought-begetting, the language lesson upon the slate was an exercise in active thinking through written words, and the oral expression furnished a test by which the teacher could ascertain what she had accomplished in getting her pupils to think.

The first thing necessary in making the pupil think is best shown by relating another incident. The catalogue of a well-known school announced that the teachers were aiming to get their pupils to read Latin at sight and to think in more tongues than one. A captious superintendent wrote to the principal, saying, "I envy you. How do you do it? We would be satisfied if we could make pupils think in English." The reply was equally sharp and suggestive: "You ask how we make pupils think. I answer, By giving them something to think about. If you ask how we make them think in more tongues than one, I answer, By giving them, in addition to the materials of thought, the instruments of thought as found in two or more languages." A suggestive reply.

The first step in training a pupil to think is to furnish him proper materials of thought, to develop in his mind the concepts which lie at the basis of a branch of study, and which must be analyzed, compared, and combined in new forms during the prosecution of that study. Just as little as a boy can draw fish from an empty pond, so little can he draw ideas, thoughts, and conclusions from an empty head. If the fundamental ideas are not carefully developed when the study of a new science is begun, all subsequent thinking on the part of the pupil is necessarily hazy, uncertain, unsatisfactory. How can a pupil compare two ideas or concepts and join them in a correct judgment if there is nothing in his mind except the technical terms by which the scientist denotes these ideas? The idea of number lies at The first essential.

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the basis of arithmetic. How often are beginners expected to think in figures without having a clear idea of what figures denote! What teacher has not seen children wrestling with fractions who had no idea of a fraction save that of two figures, one above the other, with a line between them! How many of our arithmetics are full of problems involving business transactions of which the pupil cannot possibly have an adequate idea! Not having clear ideas of the things to be compared, how can the learner form clear and accurate judgments and conclusions?

Proper thought-material.

So essential to correct thinking is the development of the concepts and ideas which lie at the basis of each science, that we may designate the giving to the pupil of something to think about as the first and most important step in the solution of the educational problem before us. In other words, the furnishing of the proper materials of thought is the first step in teaching others to think. The force and the validity of this proposition are easily seen if we reflect upon the essential oneness of the manifold diversities of thinking as they appear at school and in subsequent years.

It is universally conceded that education should be a preparation for life. The thinking at school should be an adumbration of the thinking beyond the school. The possession of enough data, or thought-materials, for reaching trustworthy conclusions, which is the indispensable requisite of successful thinking at school, is likewise a necessary requisite of successful thinking in practical life. It behooves us to inquire into the nature and foundation of the thinking of men in the professions, and in other vocations, for the purpose of gaining further light upon the problem before us. Let us, then, inquire into the nature and foundation of the thinking of men eminent in a profes-

Thinking in the professions.

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sion or prominent in some other vocation. The professional man may have less native ability, less general knowledge, less culture and education, less mental power than the client whom he advises or the patient for whom he prescribes; and yet his inferences and conclusions are accepted as more trustworthy than those of men outside of the given profession, because he has a knowledge of facts and data which they do not possess. If he be a physician, special training and professional experience have taught him how to observe the symptoms of different diseases; how to eliminate sources of doubt and error; how to reach a correct diagnosis of difficult cases, and how to apply the proper remedies. If he be a lawyer, he has been taught how to examine court records; how to detect and guard against flaws in legal documents; how to find and interpret the law in specific cases; how to protect the life and property of his client. The judge on the bench is learned in the law, though he may be ignorant of science, literature, agriculture, commerce, and manufactures. He is aided in arriving at correct conclusions by thought-materials which are not in the possession of laymen.

How does the thinking of an expert differ from that of other men? Not so much in the processes of thought as in the data upon which he reasons. An ordinary witness may testify as to matters of fact; the expert is supposed to possess extensive knowledge and superior discrimination in a particular branch of learning or practice; hence he may be a witness in matters as to which ordinary observers cannot form just conclusions, and he is held liable for negligence in case he injures another from want of proper qualifications or proper use of the thought-materials necessary to form trustworthy conclusions. From this point of view we can see new force and beauty in the remark of Fitch that teach-

The thinking of experts.

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ing is the noblest of the professions, but the sorriest of trades. The aim of a trade is to make something that will sell; its ultimate aim is money, a livelihood. Teaching and the other professions, although they cannot be sundered from money-making, have a nobler aim. This arises out of the thought-materials with which they deal. If a teacher's mind does not busy itself with these, he sinks to the level of a tradesman. A very keen observer said of the head of a large boarding-school, that he had learned his trade from the principal of a large normal school under whom he had been trained. The remark, if true, was severe, but significant. It was an intimation that the substance of the thinking of these two men was business rather than education; that their conversation about the quality of the beef and mutton served, about the loaves of bread, the pounds of butter, and the bushels of potatoes consumed each week, indicated that they were thinking more of the stomach and the purse than of the things of the mind; that their aim was a large attendance and a large cash-balance at the end of the year rather than the mental growth and professional preparation of their students. Their thinking was efficient and trustworthy in the domain in which it was exercised. It partook of the nature of trade-thinking, and lacked professional quality because it did not concern itself with problems of mental growth and moral training, with the proper sequence of studies, with the educational value of different kinds of knowledge, and with the best methods of economizing the time and effort of their students.

Teaching not a trade.

In several aspects teaching is like a trade. Every art has its mysteries, with which those who practise it must be familiar if they would succeed. Teaching is no exception; and if the annual institute or the school of pedagogy fails to clarify these mysteries

Mysteries.

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by putting the teachers in possession of materials for thought and of methods of applying knowledge to beget thinking which are not within the ken of the average parent and the general public, then failure must be written over the outcome. A mystery is a lesson to be learned. A scrutiny of the mysteries which characterize every trade and every art will serve not merely to emphasize the necessity for furnishing proper thought-materials, but will be helpful also in paving the way for the consideration of another essential in training pupils to think. Let us view them in the concrete.

A machinist, who was also a skilled mechanic, was compelled by circumstances to quit his trade and to accept a position as janitor. One day the pipe leading from the sink to the sewer was clogged. The teacher, in conjunction with a carpenter, worked a long time to fix it, but in vain. The janitor was called, who in a few moments overcame the difficulty by the application of a principle in natural philosophy on which the teacher could have talked learnedly, although he knew not how to apply it in the given case. The janitor related how the foreman in a foundry was baffled in the effort to bore a hole through a piece of iron until a workman, trained under a foreign master, suggested the purchase of two things at a drug-store by means of which the hole was easily bored. When the druggist asked about the use that was to be made of these chemicals, he was told that the use was one of the mysteries of the machinist's trade. Examples.

Next, the carpenter fixed the mortise lock of a door which needed attention, and the others lauded the skill with which he handled his tools and applied his knowledge. Before the three separated, the janitor's son came with a word which he could not find in his lexicon. With the aid of chalk and black-board and gram-

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mar, the teacher showed how to dig out the roots of a Greek verb and what beautiful changes occur in its conjugation. The turn had come for the tradesmen to admire the mysterious skill and power of the teacher.

In applying the principle of natural philosophy, the janitor made skilful use of one or two tools which the teacher and the carpenter had never seen. He could express thought through the tools of his own handicraft, in ways that they could not. Each one of the three men knew the tools and the mysteries of his own vocation. During the entire scene there was not a logical flaw in the thinking of any one of them. Probably there was little difference in their native ability; certainly none in the fundamental nature of their thought-processes. The practical difference resulted from the data at their command and from the tools they were using to express the thoughts peculiar to their several vocations.

The power to use tools, instruments, and machinery lifts man above the brute creation. There is labor-saving machinery in thinking as well as in maual labor.

Man, the tool-user.

The more perfect the tools with which we work the greater the results we can achieve without waste of effort. In thinking as well as in working we must use the best tools in order to attain the greatest facility and efficiency. Yonder are two wheat-fields. In one of them a giant is wielding the sickle of our forefathers; in the other a youth, not yet out of his teens, is at work. At the close of the day the work of the giant will not bear comparison with that of the lad, because the latter was sitting upon a self-binder. They had the same material to work upon, yet, in spite of his superior strength, the giant could not cope with his weaker though better-equipped competitor. In like manner, the youth who has mastered the algebraic equation, or the symbols and formulas of chemistry, is in many respects the

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superior of a much brighter man who is not in possession of these tools or instruments of thought. A boy of average capacity who goes through a good high school thereby acquires certain fundamental ideas and the accompanying instruments of thought by which he is enabled to solve problems entirely beyond the power of a much brighter boy who never studies beyond the grammar grade.

Instruments of thought the second essential.

The instruments of thought are generally spoken of as symbols, whilst the materials of thought are the things for which the symbols stand. In thinking, the mind may employ the ideas which correspond to the things in the external world; or it may employ the symbols by which science indicates things that have been definitely fixed or quantified. Failure to distinguish the sign from the thing signified, the symbol from its reality, leads to confusion in thought and to the most disastrous results in mental development. Loss of appetite for knowledge must inevitably result from methods of teaching by which the pupil is expected to learn the sounds of the letters from their names, or musical sounds from the notation on the staff, or the ideas of number from the arabic notation, or a knowledge of flowers from the technical terms of a textbook, or a knowledge of chemical elements and substances from the definitions, descriptions, and formulas of a scientific treatise. The symbol is indispensable in advanced thinking; but to expect the learner to get the fundamental ideas of a science from words, symbols, and definitions is evidence that the teacher does not understand the nature of thinking. It may, therefore, be helpful to set forth clearly the important distinction between thinking in things and thinking in symbols; to point out their relative value in mental development; and to fix their place in a rational system of education.

Confusion in thought and practice.

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II

THINKING IN THINGS AND IN SYMBOLS

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The rote system, like other systems of its age, made more of forms and symbols than of the things symbolized. To repeat the words correctly was everything, to understand the meaning nothing; and thus the spirit was sacrificed to the letter.

HERBERT SPENCER.

Words are men's daughters, but God's sons are things.

JOHNSON.

For words are wise men's counters,—they do but reckon by them,—but they are the money of fools.

HOBBES.

It is only by the help of language (or some other equivalent set of signs) that we can think in the strict sense of the word; that is to say, consider things under their general or common aspects.

SULLY.

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II

THINKING IN THINGS AND IN SYMBOLS

WITHIN half a mile of the Susquehanna River a teacher was asking the class, "Of what is the earth's surface composed?" "Of land and water," was the reply. In answer to a question by the superintendent concerning the earth's surface, one boy declared that he had never seen the earth. He had been acquiring words without the corresponding ideas. Turning to another boy, this official said, "Will you please show me water?" With a gleam of satisfaction on his face, the lad raised his atlas, pointed to the blue coloring around the map of North America, and said, "That is water." "Will you please drink it?" The expression on the faces of teacher and pupils indicated that all felt as if some one had committed a blunder. Where did the blunder lie? Had the teacher taught what should not be learned? Surely, every child should learn how water is indicated on a map. Did the boy use language wrong in idiom? By no means; for, as every student who has handled a lexicon well knows, many words have both a literal and a tropical, or figurative, meaning. If, pointing to an object, the teacher says, "This is a desk," he uses the word *is* in its literal sense. On the other hand, if he points to a division on the map of the United States, and says, "This is Pennsylvania," he does not mean that the colored surface to which he is pointing is the real State of Pennsylvania (if it were, a political boss could pocket it, and carry it the rest of his days with-

Lesson in geography.

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out further trouble). What is meant is, that a given space on the map indicates or represents Pennsylvania, the word *is* being used, in the latter instance, in a figurative sense. Whether the word *is*, in the expression, "This is my body," should be understood in a literal or in a figurative sense has been discussed for ages in the Christian church. In the answer of the boy we strike a distinction in thought that lies at the basis of good teaching in all grades of schools, from the kindergarten to the university,—namely, the distinction between thinking in things and thinking in symbols. In one sense of the word, all thinking is symbolic; for the percepts, concepts, and images of external objects which the mind employs in the thinking process are symbolic of the things for which they stand. But in advanced thinking, and especially in scientific investigations, objective symbols, such as words, signs, letters, equations, formulas, technical terms and expressions, are utilized to facilitate the thinking process. Take the age questions in mental arithmetic that have been prematurely inflicted upon so many pupils in the public schools. So long as the mind consciously carries A's age and the wife's age, using the clumsy instruments of arithmetical analysis, the thinking is difficult indeed. As soon as x is made the symbol of A's age, and y the symbol of the wife's age, so that the conditions of the problem can be thrown into algebraic equations, the difficulty vanishes. In the algebraic solution the mind drops all thought of A's age and the wife's age while manipulating the signs and symbols of the equation, and restores the meaning of the symbols only when their value in figures has been found. The algebraic solution is a genuine specimen of thinking in symbols, and illustrates the labor-saving machinery which the human mind employs, more or less, in all the most difficult scientific investigations.

Two kinds of thinking.

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What is a symbol? It is a mark, sign, or visible representation of an idea. The mathematician uses the symbol to represent quantities, operations, and relations. The chemist uses the symbol to indicate elements and their groupings or combinations. The theologian applies the term symbol to creeds and abstract statements of doctrine. The grips, countersigns, and passwords of a secret society may be spoken of as symbols of the ideas, aims, and principles of the organization. Often the symbol is chosen on account of some supposed resemblance between it and that for which it stands, as when black is made the symbol of mourning, white of purity, the oak of strength, and the sword of slaughter. "A symbol," says Kate Douglass Wiggin, "may be considered to be a sensuous object which suggests an idea, or it may be defined as the sign or representation of something moral or intellectual by the images or properties of natural things, as we commonly say, for instance, that the lion is the symbol of courage, the dove the symbol of gentleness. It need not be an object any more than an action or an event, for the emerging of the butterfly from the chrysalis may be a symbol of the resurrection of the body, or the silver lining of the cloud typify the joy that shines through adversity." Frequently the symbol is chosen arbitrarily, or because it is the first letter of the word which denotes the quality, substance, thing, or idea for which the symbol stands. Generally the symbol is a visible representation, but it may also address the other senses, notably the ear and the sense of touch. The Standard Dictionary excludes the portrait from the extent or scope of the symbol, and confines it to the representation of that which is not capable of portraiture, as an idea, state, quality, or action. It is well to bear this limitation in mind during the present discussion.

Symbol defined.

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A few illustrations will serve to fix the sense of the word symbol. In some parts of America the tramps have a system of symbols of their own, a given mark on the front gate indicating a good place to ask for a meal, another indicating a cross dog in the rear yard. That which the tramp fears or likes is not the mark which he sees, but a very real thing which that mark suggests to his mind. A number of the apostles were fishermen by trade. The fish became a very significant symbol in the days of early Christianity. The letters in the Greek name for fish are the initial letters of the expression, Jesus Christ, God's Son, Saviour. It is one of many instances showing how the human mind delights in heaping symbol upon symbol to conceal precious meanings from the uninitiated.

Examples.

What was the mental condition of the lad spoken of at the beginning of this chapter? The boy knew the real thing long before he knew the first symbol for water. Without doubt he had tasted it, played in it against his mother's will, been washed in it against his own will, for months before he learned the first symbol for water used in common by him and others, which was probably the spoken word. Up to that time he thought of water in some mental picture or image which had been formed upon the eye and then upon mind somewhat as the picture is formed through the art of the photographer. Up to the time that he learned the spoken word for water this liquid suggested mental pictures which constituted a thinking in things* rather than in symbols, using the latter term according to the limitation set by the Standard Dictionary. On entering school he

Symbols for water.

* For brevity's sake the phrase, thinking in things, is preferred to the more accurate but less convenient expression, thinking in the images of things.

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was taught to read; he added to the ear-symbol the eye-symbol,—that is, the written or printed word, which he may have associated at first with the real thing, or with the spoken word; of course, very soon with both, if correct methods of teaching were followed. Next, he was taught the map-symbol. The blunder which the teacher on the banks of the Susquehanna had committed consisted not in teaching how water is indicated on a map, but in not pointing to the majestic river near the school-house, and associating the water in its channel with the representations of water on a map. If the boy studied Latin or Greek, he was taught new symbols for water in the corresponding words of these languages. If he studied chemistry, he early learned the composition of water, and was thenceforth taught to write it H_2O, a symbol enshrining a new truth and lifting him to higher planes of thought by giving him a new instrument as well as new materials of thought.

Sources of error.

Half the errors in teaching arise from the fact that the teacher does not constantly bear in mind the distinction between the symbol and the thing for which the symbol stands, thus giving rise to confusion in the mind of the learner. A class was bounding the different States of the Union. At the close of the recitation the superintendent suggested that the class bound the school-house. It was bounded on the north by the roof, on the south by the cellar, on the east and west by walls. The geography classes of an entire city were caught in that way. Either the pupils had not been taught, or else they had forgotten the difference between the real directions and the ordinary representation of them on the surface of a wall map. Sometimes the confusion exists in the mind of the teacher as well as in the minds of the pupils. Then he expects them to learn one thing while he teaches them another. By the methods

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formerly in vogue the pupil was expected to learn the sounds of the letters from their names; the pronunciation of the word from the names of the letters which compose it; the names, forms, and sounds of letters from the word taught as a whole; the musical sounds from the notation on a musical staff; the ideas of number, of fractions, from the corresponding symbols; the units of denominate numbers and of the metric system from the names used in the tables of weights and measures; the flowers of the field from the nomenclature of the botany; the substances and experiments in chemistry from the descriptions and pictures of a text-book. Such teaching has given rise to endless lectures, editorials, and discussions upon the use of the concrete in teaching, upon the value of thinking in things, upon the importance of object-lessons, laboratory methods, and the like.

Elementary instruction.

But there is another side to the question. There comes a time in the development of the pupil when he must rise above the sticks and shoe-pegs and blocks of the elementary arithmetic, and learn to think in the symbols of the Arabic notation. Later he must learn to think in the more comprehensive symbols of the algebraic notation. He must learn to think the abstract and general concepts of science, and, in thinking these, to use the devices, technical terms, and other symbols which the scientists have invented to facilitate their thinking.

More advanced instruction.

Hear a parable. A teacher sat down to dinner. The waiter handed him the bill of fare. The proprietor followed the waiter to the kitchen, directed him to cut out the names of the eatables which had been ordered, and to carry these names on plates to the dining-room. "It is not these words," exclaimed the guest, "that I desire to eat, but the things in the

A parable.

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kitchen for which these words stand." "Isn't that what you pedagogues are doing all the time, expecting children to make an intellectual meal on words such as are found in the columns of the spelling-book and attached on maps to the black dots which you call cities? My boy gravely informs me that every State capital has its ring, because on his map there is always a ring around the dot called the capital of a country." The teacher was forced to admit that there is, alas! too much truth in the allegation. In the afternoon he took revenge. Knowing that the proprietor had a thousand-dollar draft to be cashed, he arranged with the banker to have it paid in silver coin. When the landlord saw the growing heap of coin, he exclaimed, "If I must be paid in silver, can you not give me silver certificates?" "Did you not intimate to me," said the teacher, tapping him on the shoulder, "that it is the real things we want, and not words and symbols which stand for realities?" The landlord was obliged to admit that in the larger transactions of the mercantile world it saves time and is far more convenient to use checks, drafts, and other symbols for money than it would be to use the actual cash. In elementary transactions, like the purchase of a necktie, it is better to use the cash, to think and deal in real money, but when it comes to the distribution of five and one-half million dollars among the school districts of Pennsylvania, it is better to draw warrants upon the State Treasurer, to use checks and drafts, and to think in figures, than it would be to count so much coin, and send the appropriation in that form all over a great commonwealth.

The parable hardly needs an interpretation. Its lesson points in two directions. On the one hand, it shows in the true light every species of rote teaching, of parrot-like repetition of definitions, Its interpretation.

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statements, and lists of words which give a show of knowledge without the substance. It puts the seal of condemnation on most forms of pure memory work. It sounds the note of warning to all teachers who are trying to improve the memory by concert recitations. The boy whose class was taught to define a point as position without length, breadth, or thickness, and who, when asked to recite alone, gave the definition, "A point has a physician without strength, health, or sickness," is but one of many specimens of class-teaching condemned by the parable. It says in unmistakable terms that all elementary instruction must start in the concrete, taking up the objects or things to be known, and resolutely refusing to begin with statements and definitions which to the children are a mere jargon of words.

Making blockheads.

On the other hand, the parable indicates how too long-continued use of the concrete may arrest development, and hinder the learner from reaching the stages of advanced thinking. It hints that the too constant use of blocks, however valuable at first, ultimately begets blockheads, instead of intelligences capable of the higher life of thought and reflection. A rational system of pedagogy involves proper attention to the materials of thought and proper care in furnishing the instruments by which advanced thinking is made easy and effective. In one respect the parable does not set forth the whole truth. It makes no account of differences in thinking due to heredity and mental training. The differences in native ability are, however, not as great as is generally supposed (unless the feeble-minded enter into the comparison); the differences due to correct training, or the neglect of it, are far more striking. The work expected of the pupil should, of course, tally with his capacity; otherwise it will force him to resort to pernicious helps, beget in him wrong habits of study,

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rob him of the sense of mastery and the joy of intellectual achievement, and destroy his self-reliance, his power of initiative, and his ability to grapple with difficult problems and perplexing questions. The power to think grows by judicious exercise. Here better than anywhere else in the whole domain of school work can we distinguish the genuine coin from its counterfeit, and discriminate between true skill and quackery, between the artist and the artisan. It is at this point that most help can be given to young teachers by a good course of lectures on learning to think and on the difficult art of stimulating others to think.

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III

THE MATERIALS OF THOUGHT

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A vast abundance of objects must lie before us ere we can think upon them.

GOETHE.

The young have a strong appetite for reality, and the teacher who does not make use of that appetite is not wise.

J. S. BLACKIE.

The child's restless observation, instead of being ignored or checked, should be diligently ministered to, and made as accurate as possible.

HERBERT SPENCER.

What do you read, my lord?
Words, words, words.

HAMLET.

You have an exchequer of words, and I think no other treasure.

TWO GENTLEMEN OF VERONA.

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III

THE MATERIALS OF THOUGHT

THE hotel man was right in his criticism of teachers who expect their pupils to make an intellectual meal on mere words. For three hundred years educational reformers have been hurling their epithets against this abuse. Has it been banished from the schools? By no means. It crops out anew with every generation of teachers and in every grade of instruction from the kindergarten to the university. During the years in which a child acquires several languages without difficulty, if it hears them spoken, the mind is eager for words and often appropriates them regardless of their meaning. The child learns rhymes and phrases for the sake of the jingle that is in them, and cares very little for clearly defined ideas and thoughts. So strong and retentive is the memory for words that the child finds it easier to learn by heart entire sentences than to think the thoughts therein expressed. Like a willing and obedient slave, the verbal memory can be made to do the work of the other mental powers. The merest glimpse at a picture may recall all the sentences on the same page, so that the pupil can repeat them with the book closed or the back turned towards the reading chart. The recollection of what the ear has heard may thus relieve the eye of its function in seeing words, degrade the child to the level of a parrot, and thereby greatly hinder progress in learning to read. Very frequently the memory is required to perform work belong-

Words without thoughts.

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ing to the reflective powers, because the learner is thereby saved the trouble of comprehending the lesson and expressing its substance in his own language. Moreover, the accurate statement of a truth is apt to be accepted as evidence of knowledge and correct thinking. The average examination tests very little more than the memory. If the answers are given in the language of the text-book or the teacher, the examiner seldom supplements the written work by an oral examination. Thus there is a constant tendency on the part of teachers and pupils to rest satisfied with correct forms of statement; and the pernicious custom of feeding the mind on mere words is encouraged and perpetuated. Exposed in plain terms, this abuse of words is condemned by everybody; yet it is as easy at this point to slide into the wrong practice as it is to fall into the sins forbidden by the decalogue. Like Proteus, this abuse assumes diverse and unexpected forms; instance after instance is needed to put young teachers on their guard and to expose its pernicious effect upon methods of instruction and habits of study. To cry "words, words, nothing but words," will not suffice to correct the evil, for words must be used in the best kind of instruction. Line upon line, precept upon precept, example after example is needed to expose the folly of learning words without corresponding ideas, of teaching symbols apart from the things for which they stand. No apology is needed for citing laughable and flagrant instances in point; ridicule sometimes avails where good counsel fails.

Spelling.

A superintendent who advocates spelling-bees and magnifies correct orthography out of all proportion to its real value startled a class in the high school by asking for the spelling of a word of five syllables. Not receiving an immediate answer, he referred to the Greek. This made the spelling easy for at

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least one pupil. A year later he accosted this pupil, saying, "You are the only person that ever spelled psychopannychism for me." "What does it mean?" was the question flashed back at him in return for his compliment. He could not tell, because he did not know. For years he had worried teachers and pupils with the spelling of a word whose meaning he had failed to fix accurately in his own mind.* What more effective method could be devised for destroying correct habits of thinking?

There is a time in the life of the child when it is hungry for new words. The habit of seeing words accurately and learning their spelling at first sight is then easily acquired, provided there is no defect in the pupil's eyes. In cases of defective eyesight the first step towards the solution of the spelling problem, as well as the first condition in teaching the pupil to think accurately, is to send him to a skilled oculist (not to a so-called graduate optician or doctor of refraction, who must make his living out of the specatcles he sells, and whose limited training does not enable him to make a correct diagnosis in critical cases). Correct vision will assist the pupil not merely in learning the exact form of the words which he uses in writing, but also in forming correct ideas of the things with which the mind deals in the thought-processes. Although great stress should be laid upon the orthography of such words in common use as are frequently misspelled,—daily drill upon lists of these should not be omitted at school while the child's word-hunger lasts,—yet it is vastly more important to acquire an adequate knowledge of the ideas, concepts, and relations for which the words stand. To spend time upon

Eyesight.

* Psychopannychism denotes the doctrine that the soul falls asleep at death, not to awaken until the resurrection.

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the spelling of words which only the specialist uses, and which are easily learned in connection with the specialty by a student possessing correct mental habits, is a form of waste that cannot be too severely condemned. It is far better to spend time in building concepts of things met with in real life.

The meaning of very many words is, of course, learned from the connection in which they occur. This, however, is not true of sesquipedalian words like the one mentioned above, nor of the technical terms by which science designates the things that have been accurately defined or quantified.

Technical terms are used to denote the ideas which lie at the basis of science. These fundamental ideas are appropriately called basal concepts. Since basal concepts cannot be transferred from the teacher's mind to the pupils' minds by merely teaching the corresponding technical terms, they must be developed by appropriate lessons. If this be neglected, there may be juggling with words and a show of knowledge; but close, accurate thinking is impossible. This seems to be so self-evident that one would hardly expect to meet violations of such a simple rule in the art of teaching. And yet it is related of the professor of physics in one of our largest universities that he began his course of lectures in this wise: "A rearrangement of the courses of study deprived you of the usual instruction in elementary physics. That is your misfortune, and not my fault." Thereupon, he began his lectures on advanced physics as if the preparation of his class to think the concepts at the foundation of his science could be ignored without detriment to the progress of the student, as if confused minds and unsatisfactory thinking were not the inevitable outcome of juggling with technical terms apart from the concepts

Fundamental ideas.

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which they denote. A master in the art of teaching would have started on the plane occupied by the students. By development lessons he would have lifted them to the plane of thought on which he intended to move. He would have considered their mental progress of more consequence than the course of lectures which he was in the habit of delivering. The student, and not the study, should have held the chief place in his professional horizon.

In another State university the professor of physics applied to an influential member of the board of trustees for an appropriation for apparatus. "Teach what is in the text-book; then you will not need apparatus," was the reply. It seems almost incredible that a trustee of a modern university should fail to see the difference between an experiment actually performed and a description of the experiment in a text-book. More incredible still does it seem when we hear of professors who see no difference between an experiment made in the presence of a student and an experiment made by the student himself.

Abuse of text-books.

Pictures of apparatus and descriptions of experiments should, of course, not be despised or neglected. They are helpful in forming concepts of that which cannot be brought before a class. When made by the learner himself, as a result of his own work, they serve to clarify his thinking, and furnish a sure test of the pupil's progress and of the teacher's skill as a guide and instructor. A drawing, or even a statement in the pupil's own words, is often an astonishing revelation of the crude notions which pictures give. The city lad who said that a cow was no bigger than a finger-nail because he had often measured its size in the First Reader is a typical example. The ability to interpret pictures and descriptions comes from actual knowledge

Apparatus and experiments.

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of things similar to what is depicted or described. The noted teacher, Agassiz, made a difference in his directions to beginners and advanced students. To the former he would give specimens, with directions to study them without referring to a book. Having taught them how to use their eyes, he would gradually lead them to the method of interpreting and verifying the statements of an author. And when the advanced student was set to work at original investigations, he was told to study certain books, as it would save much valuable time. One of his pupils writes, "I shall never forget a forceful lesson given me by the great Agassiz, when I studied with him in the Museum of Cambridge. I worked near a young man from Cleveland, Ohio, who has since achieved distinction as a teacher of biology. I was comparatively a beginner, however, while he was well advanced in his studies. On a certain day Agassiz came sauntering by, and stopped long enough to tell me not to use the library so much, but to confine myself to observations of the specimens on hand and the writing of my observations and comments. Passing on a little farther, he spoke to my friend and said, 'Albert, when you go home, this summer, to Cleveland, I wish you would make a special study of a certain kind of fish found in the harbor there. It is not found plentifully anywhere else in the world. Take a row-boat and go three hundred yards northeast of the point of the breakwater, and you will find them in abundance. Before going home, get the only three books ever written on this fish from the library here and read them. It will save your time to read them before beginning to study the fish itself.'" * Agassiz was as anxious to teach

Agassiz.

* For this incident the writer is indebted to Superintendent L. H. Jones, of Cleveland, Ohio.

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the right use of books as is the professor of literature; but he adapted his directions to the degree of advancement which his students had attained, and did not neglect the formation of the basal concepts and the habits of study needful in the sciences he taught.

Botany.

How little the exhortations of our educational reformers have been taken to heart by some teachers is evident from the recent experiences of a normal school principal, who had great difficulty in finding a satisfactory teacher of botany. The students could invariably answer the questions of the State Board of Examiners by filling pages of manuscript with technical terms. In the field they could not distinguish one plant from another. In despair, the principal said to his teacher of psychology, "Why can we not apply common sense to the teaching of botany? Can we not plant seeds, watch their growth, and study the growing specimens instead of the pictures in a text-book?" "If you will give me the class in botany, I will try it," was the reply. Before the next class took up botany, every chalk-box was emptied and every flower-pot utilized in the planting of seeds. In no long time there appeared on the fences of neighboring farms sign-boards with the inscription, "Trespassing on these fields is forbidden, under penalty of the law." The members of the class were traversing the country, studying the real flowers, the growing plants, instead of the technical terms of a text-book. At the next final examination, the herbarium which each one had prepared, together with the accompanying analysis and drawings of parts which could not be described, including colorings in imitation of the actual colors of the flowers, gave evidence of real knowledge, and served to satisfy the examiners, although the array of technical terms was far less formidable.

If violations of the fundamental laws of teaching occur

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in our higher institutions of learning, what may we not expect in the lower schools where the teaching is intrusted to young people of limited education? Nevertheless, it is a notorious fact that the worst forms of teaching are found in our higher institutions of learning, where many of the professors seem to know as little of the science of education as the motorman knows of the science of electricity; otherwise they would make impossible the use of "ponies, coaches, and keys," by means of which the student taxes the memory rather than the understanding, and ultimately loses all power of independent thought and investigation. Such helps arrest mental development, destroy the power of original thinking, and do more harm than the practice of feeding the mind with mere verbal statements which in course of time may acquire content and meaning. The study of the sciences which classify minerals, plants, insects, birds, fishes, and other animals may degenerate into a mere study of words, even when the student acquires some familiarity with the specimens to be classified. The scientific name is the one thing about a flower with which the Creator has had nothing to do, and if the recognition of the scientific name is the chief or sole aim of the student of botany, it is a genuine case of feeding the mind on words.

By those who are fond of scientific pursuits the dead languages are sometimes despised as though the study of them were learned playing with mere words. Among people who begin their education somewhat late in life there is a strong temptation to estimate linguistic studies very far below their true value as a means for disciplining the reasoning faculty. When pursued in the right way, the study of the classical languages furnishes as much good material for thought as the natural sciences. Huxley may charm an audience by a lecture on a piece of chalk; the philologist can excite equal interest by a

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lecture on the word chalk. Words grow and undergo changes according to well-defined laws which furnish as much food for thought as the laws governing the union of atoms or the motions of the heavenly bodies. The words of a lexicon contain as much of precious interest in the sight of man as the manufactured gases or the plucked leaves and dissected flowers of the laboratory. Greek and Latin roots have more vitality in them than the collections of stones, stuffed birds, and transfixed bugs in the museum. The endings of nouns, adjectives, pronouns, and verbs furnish ample opportunity for observation, comparison, and reflection; their functions in the syntax of the sentence furnish splendid exercises in formal and qualitative thinking. If, however, the time of the pupil is entirely consumed in mastering the hundreds of exceptions to the rules of gender and case, of declensions and conjugations, of syntax and prosody, it is another sad instance of feeding the mind on mere words. The pupil who begins the study of any foreign language before he has reached his teens should acquire the power to read the language at sight; otherwise there has been something faulty in the methods of teaching or of study, or in both. A man is as many times a man as he knows languages; and the comparison of the idioms of two or more languages furnishes most excellent material for careful and accurate thinking. In translating an author like Plato the student must think the thoughts of a master mind, weigh words so as to detect the finer shades of meaning, and arrange them in sentences that shall adequately express the meaning of the original. The value of pure mathematics, especially the Euclidian geometry, as a means for the cultivation of thinking, lies in the limited number of fundamental concepts which must be clearly fixed and in the nature of the reasoning

Words as material for thought.

Geometry as thought-material.

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by which the truth of the theorems is established. The axioms are few in number and easily grasped; the quantities to be defined can, without difficulty, be set in a clear light before the understanding; the chain of proof compels the mind to join ideas by their logical nexus, and if the learner persists in memorizing the demonstration, he is at once detected. And yet when, as sometimes happens, he goes over several books of geometry without clearly perceiving the difference between an angle and a triangle, it must be a genuine specimen of acquiring words without the corresponding ideas.

S. S. Greene's views.

The words of S. S. Greene deserve the attention of every teacher anxious to prevent the formation of vicious habits of thought by the pupils in our schools and colleges. Years ago he wrote as follows: "While an external object may be viewed by thousands in common, the idea or image of it addresses itself only to the individual consciousness. My idea or image is mine alone,—the reward of careless observation, if imperfect; of attentive, careful, and varied observation, if correct. Between mine and yours a great gulf is fixed. No man can pass from mine to yours, or from yours to mine. Neither, in any proper sense of the word, can mine be conveyed to you. Words do not convey thoughts; they are not vehicles of thought in any true sense of that term. A word is simply a common symbol which each associates with his own idea or image. Neither can I compare mine with yours, except through the mediation of external objects. And, then, how do I know that they are alike; that a measure called a foot, for instance, seems as long to you as to me? My idea of a new object, which you and I observe together, may be very imperfect. By it I attribute to the object what does not belong to it, take from it what does, distort its form, and otherwise pervert it. Suppose, now, at the

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time of observation we agree upon a word as a sign or symbol of the object or the idea of it. The object is withdrawn; the idea only remains,—imperfect in my case, complete and vivid in yours. The sign is employed. Does it bring back the original object? By no means. Does it convey my idea to your mind? Nothing of the kind; you would be disgusted with the shapeless image. Does it convey yours to me? No; I should be delighted at the sight. What does it effect? It becomes the occasion for each to call up his own image. Does each now contemplate the same thing? What multitudes of dissimilar images instantly spring up at the announcement of the same symbol!—dissimilar not because of anything in the one source whence they are derived, but because of either an inattentive and imperfect observation of that source, or some constitutional or habitual defect in the use of the perceptive faculty."

Dr. J. P. Gordy, to whom credit is due for the preceding quotation, further says, "Words are like paper money; their value depends on what they stand for. As you would be none the richer for possessing Confederate money to the amount of a million dollars, so your pupils would be none the wiser for being able to repeat book after book by heart, unless the words were the signs of ideas in their minds. Words without ideas are an irredeemable paper currency. It is the practical recognition of this truth that has revolutionized the best schools in the last quarter of a century. . . . In what did the reform inaugurated by Pestalozzi consist? In the substitution of the intelligent for the blind use of words. He reversed the educational engine. Before his time teachers expected their pupils to go from words to ideas; he taught them to go from ideas to words. He brought

J. P. Gordy's statement.

Pestalozzi's reform.

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out the fact upon which I have been insisting,—that words are utterly powerless to create ideas; that all they can do is to help the pupil to recall and recombine ideas already formed. With Pestalozzi, therefore, and with those who have been imbued with his theories, the important matter is the forming of clear and definite ideas." *

It was a remark of Goethe that genius begins in the senses. With equal truth we may say that thinking begins in the senses. Like unto the genius, the thoughtful man perceives and interprets what has escaped the notice of other people. To sight he adds insight. That which he sees is subsumed under the proper class or category, and is viewed from different sides until its significance is discovered, and a place is assigned to it in the intellectual horizon and in the external world. Every fact thus seen in its relation to other facts serves as a basis for further observation, reflection, and comparison. Not merely the genius, but every other person whose thinking is above the average in vigor and accuracy, has the power to perceive things which escape the eyes and ears of other people. Through habits of careful and correct observation he fills his mind with images, ideas, concepts of the objects of thought and of the relations which exist between these objects, and thereby acquires the materials for the comparisons which constitute the essence of good thinking. If the strength of a student is exhausted in gathering and storing the materials for thought, his mind becomes a wilderness of facts; if he reasons without the facts, his conclusions are more unreal than the figments of the imagination.

Sight and insight.

Truth is the best thought-material for the mind to act

* "Lessons in Psychology," pages 260–267.

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upon. The possession of truth is the aim and the goal of all correct thinking. Knowledge of the truth implies the conformity of thinking with being. The world within should be made to correspond with the world outside of us.

Truth the proper thought-material.

Fortunately, the self-activity of children is towards the objective world of things which they can see, hear, smell, taste, and handle. From inner impulse their thinking is directed towards the cognition of objects. One of the functions of nature study is to beget habits of careful and accurate observation. This is a characteristic feature of the laboratory method as distinguished from the library method. A training in both is essential to a complete education. The library stores the treasures of knowledge which the human race has gathered and makes them accessible to the learner. The laboratory shows him by what methods truth is discovered and tested and verified. The German professor who declined to visit a menagerie, asserting that he could evolve the idea of the elephant from his inner consciousness, may have spent much time in reading books and in speculation; but he certainly never worked in a laboratory; nor had he taken to heart the lessons which he might have learned from the sages of antiquity. Aristotle knew the importance of asking nature for facts, and he induced his royal pupil, Alexander the Great, to employ two thousand persons in Europe, Asia, and Africa for the purpose of gathering information concerning beasts, birds, and reptiles, whereby he was enabled to write fifty volumes upon animated nature. After teachers had forgotten his methods they still turned to his books for the treasures which he had gathered. In the ages in which men hardly dared to ask nature for her secrets, fearing that they might be accused of witchcraft, they turned to Aristotle as if

The laboratory and the library.

Aristotle.

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he were an infallible guide—so much so that when Galileo announced the discovery of sun-spots a monk declared that he had read Aristotle through from beginning to end, and inasmuch as Aristotle said nothing about spots on the sun, therefore there are none. This book-method of studying science has not entirely disappeared from the seats of learning. Books like Tyndall's "Water and the Forms of Water," Faraday's "Chemistry of a Candle," and Newcomb's "Popular Astronomy" may, indeed, be read or studied as literature, and thus prove a means of culture; but to accept the facts and statements of a text-book without verification is the lazy man's method of studying science; and as a method it fails to lay the foundation upon which a solid superstructure can be built. The correct method starts with observation of the things to be known, develops the basal concepts which lie at the foundation of the science under consideration, ends by teaching the pupil how to make independent investigations, how to utilize the treasures which have been preserved in our libraries, thereby furnishing an adequate supply of proper materials for thought.

Productive minds.

The habits of men who have surprised the world by their intellectual and professional achievements are very suggestive. Spurgeon kept his mind filled by constant reading. Goethe was fond of travel and utilized what he learned from others. Emerson visited the markets regularly, conversed with the men and women from whom he bought, and sought to learn their views on current events. Study the greatest thinkers the world has known, and you will find their memories to have been a storehouse of thought-materials which they analyzed, sifted, compared, and formulated into systems that win the admiration of all who love to think.

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IV

BASAL CONCEPTS AS THOUGHT-MATERIAL

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Thought proper, as distinguished from other facts of consciousness, may be adequately described as the act of knowing or judging of things by means of concepts.

MANSEL.

We cannot learn all words through other words. There is a large and rapidly increasing part of all modern vocabularies which can be comprehended only by the observation of nature, scientific experiment,—in short, by the study of things.

MARSH.

The question we ask of each thing (and of the whole experience) is, What *are* you? You have qualities which I find everywhere else; your color I find in other things; your texture and hardness and odor and form I find in other things; but they are combined in you in such a way as to make you a thing by yourself, and not anything else. And I want to know what you truly *are*,—in short, what is your essence, which is also your idea, and the purpose or τέλος of your existence.

LAURIE.

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IV

BASAL CONCEPTS AS THOUGHT-MATERIAL

THE head may be likened unto a walled city, with comparatively few building materials on the inside, and with a limited number of gate-ways through which all other materials for building purposes must pass. The walls are not made of brick or stone, but of bone; the gate-ways are the different senses through which knowledge enters the mind. The building materials on the inside are intuitive ideas which take shape in conjunction with the entrance of materials from without. The structures which are built up out of the ideas within and the sense-impressions from without are individual and general concepts. Take an orange. Its shape, color, parts, are known through the eye. Its flavor, as sweet or sour, is ascertained through taste; its odor through smell; its temperature, shape, and some other qualities through touch. These various sense-impressions, giving the mind a knowledge of essential and accidental qualities and attributes, are combined in the idea of a particular orange. If the object were a bell, its sound, parts, uses, and qualities would make impressions through different gate-ways of knowledge; the builder inside would combine them into the more or less complete idea of the object presented to the senses. From each sense-impression the mind may get a percept; the synthesis of these percepts produces the individual concept or notion.

Building concepts.

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It is helpful at this point clearly to distinguish between essential and accidental attributes. The orange may have been kept in the open air when the temperature is low. To the hand it feels cold, and this quality enters into the idea of the first orange which the child has. As other oranges which have been in a warmer atmosphere are brought to the child, the attribute cold is seen to be accidental,—that is, it is not a necessary quality of oranges in general. On the other hand, the qualities which are found in every orange—many of them hard to describe in words—become fixed in the mind as essential attributes of the orange. In course of time many objects of the same kind are presented to the senses, cognized by comparison so as to retain the essential attributes and to omit the accidentals. By this process the general notion or concept is formed.

Gate-ways of knowledge.

It is self-evident that the mind's comparisons and conclusions are unreliable in so far as the gate-ways of knowledge are defective. Few persons have perfect ears; many can never become expert tuners of pianos or reliable critics of musical performances. The man who is color-blind is not accepted in the railway service or as an officer in the navy. The man who is totally blind is never selected as a guide in daylight. On the other hand, the blind girl spoken of by Bulwer could find her way better in the darkness of the last days of Pompeii than other people, because she was accustomed to rely upon the data furnished by the other senses in making her way through the city, and had improved these as gate-ways of knowledge beyond the needs of those gifted with sight.

In building concepts of objects in nature it would be a great mistake to begin with the word instead of the thing. Just as little as a blind man can conceive the qualities color, light, darkness, through mere words, so

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little can children conceive classes of objects which have never addressed the senses. Hence great stress has been laid by educational reformers upon the cultivation of habits of observation, upon the supreme necessity of teaching by the use of objects, or so-called object-lessons. First, things, then words, or signs for things, was at one time a favorite maxim in treatises on teaching. Consistent application of the maxim would have banished the dictionary from the school-room, or at least its use as a means for ascertaining the meaning of words. In consulting the dictionary for the meaning of a word, we pass not from the thing to its sign, but in the opposite direction,—that is, from the sign to the thing signified, from the symbol to the idea for which the symbol stands. The main essential in good instruction is that the words be made significant. In primary instruction this is best accomplished by passing from the idea to the word; but in advanced instruction it is of less importance whether we pass from the word to the idea or from the idea to the word. The meaning of very many words is acquired from the connection in which they are used. For the meaning of the larger number of words in our vocabulary we never consult a dictionary. The finer shades of meaning we get not from definitions, but from quotations taken from standard authors. This fact should never tempt the teacher to trust to words, definitions, and descriptions in the formation of basal concepts. He should seek to give unto himself a clear and full account of the things or ideas which cannot spring from mere words, however skilfully arranged in sentences. The music-teacher who complained of the public schools because a seven-year-old child did not grasp his meaning when he spoke of half-notes, quarter-notes, eighth-notes, sixteenth-notes, should have known that

From things to symbols.

From sign to thing or idea.

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many children of that age have never been taught fractions, and that the idea of a fraction is obtained not from sounds (who distinguishes between half a noise and a whole noise?), but from objects which address the eye. Instead of complaining about the school which the pupil attended, a teacher acquainted with the mysteries of his art would have started with the comparison of things visible; and after having developed the idea of halves, quarters, eighths, sixteenths, by the division of visible objects into equal parts, he would have applied the idea to musical sounds.

The sense to be addressed.

In seeking to build in the mind of the learner the concepts which lie at the basis of a new branch of study, it is a legitimate question to ask by which of the gate-ways of knowledge the materials or elements for the new idea can best be made to enter the mind. At the basis of arithmetic lies the idea of number, —an idea that is evoked by the question of how many applied to a collection of two or more units. Taste and smell must be ruled out from the list of senses which can be utilized to advantage. Three taps on the desk are as easily recognized as three marks or strokes on the black-board. The sense of touch is helpful in passing from concrete to abstract numbers. To think a number when the corresponding collection of objects is not visible, but is suggested by tactile impressions, helps to emancipate the thinking process from the domination of the eye; in other words, it helps to sunder the thinking of number from a specific sense, and thus aids in the evolution of the idea of number apart from concrete objects.

Different gate-ways for different ideas.

Integers.

As already indicated, there are some basal concepts, like that of a fraction, in the development of which only one sense can be utilized to advantage. Whilst imparting the idea of a whole number, the

Fractions.

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appeal may be to the eye, the ear, and the sense of touch; the instruction designed to impart the idea of fractions to the normal child is limited to visible objects. In the instruction of the blind the other senses are addressed from necessity. The extent to which touch can supply the function of sight is full of hints to teachers in charge of pupils possessing all the gate-ways of knowledge.

Moreover, not all units are equally adapted for imparting the first ideas of a fraction. Half of a stick is still a stick to the child, just as half of a stone is still called a stone in common parlance. The half should be radically different from the unit; hence an object resembling a sphere or a circle is best adapted for the first lessons in fractions. In teaching decimals the square or rectangle is better than the circle. It is difficult to divide a circumference into ten equal parts. On the contrary, the square is easily divided into tenths by vertical lines, and then into hundredths by horizontal lines, thus furnishing also a convenient device for the first lessons in percentage.

Teaching decimals.

It is one of the aims of the training-class and the normal school to point out the best methods of developing the different basal concepts which lie at the foundation of the branches to be taught. Many of these are complex, and require great skill on the part of the teacher. The difficulty is well stated in John Fiske's discussion of Symbolic Conceptions. He says, "Of any simple object which can be grasped in a single act of perception, such as a knife or a book, an egg or an orange, a circle or a triangle, you can frame a conception which almost, or quite exactly, *represents* the object. The picture, or visual image, in your mind when the orange is present to the senses is almost exactly reproduced when it is absent. The distinction between the two lies chiefly

Basal concepts.

John Fiske on symbolic conceptions.

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in the relative faintness of the latter. But as the objects of thought increase in size and in complexity of detail, the case soon comes to be very different. You cannot frame a truly representative conception of the town in which you live, however familiar you may be with its streets and houses, its parks and trees, and the looks and demeanor of the townsmen; it is impossible to embrace so many details in a single mental picture. The mind must range to and fro among the phenomena, in order to represent the town in a series of conceptions. But practically, what you have in mind when you speak of the town is a fragmentary conception in which some portion of the object is represented, while you are well aware that with sufficient pains a series of mental pictures could be formed which would approximately correspond to the object. To some extent the conception is representative, but to a great degree it is symbolic. With a further increase in the size and complexity of the objects of thought, our conceptions gradually lose their representative character, and at length become purely symbolic. No one can form a mental picture that answers even approximately to the earth. Even a homogeneous ball eight thousand miles in diameter is too vast an object to be conceived otherwise than symbolically, and much more is this true of the ball upon which we live, with all its endless multiformity of detail. We imagine a globe, and clothe it with a few terrestrial attributes, and in our minds this fragmentary notion does duty as a symbol of the earth.

"The case becomes still more striking when we have to deal with conceptions of the universe, of cosmic forces such as light and heat, or of the stupendous secular changes which modern science calls us to contemplate. Here our conceptions cannot even pretend to represent the objects; they are as purely symbolic as the algebraic

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equations whereby the geometer expresses the shapes of curves. Yet so long as there are means of verification at our command we can reason as safely with these symbolic conceptions as if they were truly representative. The geometer can at any moment translate his equation into an actual curve, and thereby test the results of his reasoning; and the case is similar with the undulatory theory of light, the chemist's conception of atomicity, and other vast stretches of thought which in recent times have revolutionized our knowledge of nature. The danger in the use of symbolic conceptions is the danger of framing illegitimate symbols that answer to nothing in heaven or earth, as has happened first and last with so many short-lived theories in science and in metaphysics."

The word conception as used in this quotation is synonymous with concept, but elsewhere it is also used in two other senses,—namely, to signify the mind's *power* to conceive objects, their relations and classes, and to name the activity by which the concept is produced. Hence the term concept is preferred in this discussion.

To give a full account of the development of the basal concepts in the different branches of study would require a treatise on the methods of teaching these branches. All that can be attempted is to draw attention to some of the typical methods and devices adopted by eminent teachers in the development of the concepts which Mr. Fiske calls symbolic conceptions. Distance is one of the concepts at the basis of geography and astronomy. To say that the circumference of the earth is twenty-five thousand miles, that the distance of the moon from the earth is two hundred and forty thousand miles, and that the distance of the sun is ninety-two and one-half millions of miles may mean very little to the human mind, especially to the mind of a child. Supposing, however, that a boy finds a mile by actual

Concepts of distance.

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measurement, and that he finds he can walk four miles an hour, he can gradually rise to the thought of walking forty miles in a day of ten hours, or two hundred and forty miles in the six working days of a week. In one hundred and four weeks, or two years, he could walk around the globe. To walk to the moon would require a thousand weeks, or about twenty years. It is by the method of gradual approach that concepts of great distance, of immense magnitudes, of the infinitely large and the infinitely small, must be developed. To this category belong large cities like New York and London, quantities denoting the size of the earth and its distance from the sun and the fixed stars, the fraction of a second in which a snap-shot is taken, or an electric flash is photographed; such quantities are apt to remain as mere figures or symbols in the mind of the learner unless the method of gradual approach is adopted. Starting with a town or a ward with which the pupil is familiar, several may be joined in idea until the concept of a city of fifty or sixty thousand population is reached. It takes about twenty of these to make a city like Philadelphia, and five cities like Philadelphia to make a city like London. A lesson on how London is fed will add much to the formation of an adequate idea of such a large city.*

Large cities.

An adequate idea of the shape of the earth can be formed only by gradual development. The three kinds of roundness (dollar, pillar, ball) must be taught; then the various easily intelligible reasons for believing it to be round like a ball may follow in the elementary grade. As the pupil advances he may be told of the dispute between Newton and the French, the former affirming it to be round like an orange,—that is,

Shape of the earth.

*See "How London Lives," Thomas Nelson & Sons, London.

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flattened at the poles,—the latter asserting that it resembled a lemon with the polar axis longer than the equatorial diameter; and how, by measuring degrees of latitude and finding that their length increases as we approach the poles, the French mathematicians, in spite of their wishes to the contrary, proved Newton's view to be correct. The same lesson might be taught by starting with the rotation of the earth, showing by experiment the tendency of revolving bodies to bulge out at the equator, and then drawing the inference that the degrees of latitude are shortest where the curvature is greatest, and that they are longest where the curvature is least. Either method is strictly logical; but the method which follows the order of discovery, whenever it is feasible, is calculated to arouse the greater interest in minds of average capacity. The teacher who is a master of his art will supplement the historical lesson by a lesson passing from cause to consequence, so as to fix and clarify the concept formed by passing from the ground of knowledge to the necessary inference. Finally, by drawing attention to the fact that the equatorial diameters are not all of the same length, he will build up in the pupil's mind a concept of the real shape of the earth,—a shape unlike any mathematical figure treated of in the text-books on geometry. The attempt to give a complete idea of the shape of the earth in the first lessons on geography would have ended in confusion of thought; the wise teacher develops complex concepts gradually and not more rapidly than the learner is able to advance. This process may be called enriching the concept. The successive concepts, although only partial representations of what is to be known, are adequate for the thinking required at a given stage of development; the number of complete or exhaustive concepts in any department of knowledge is small indeed.

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Instructive as it often is to follow the order of discovery, it must not be inferred that this is invariably the best order of instruction. What teacher of astronomy would be so foolish as to lead a student through the nineteen imaginary paths which Kepler tried before he discovered that an elliptical orbit fitted the recorded observations of Tycho Brahe!*

The order of discovery and of instruction.

Much may be learned from the methods pursued by eminent teachers. It will abundantly pay any teacher of science to study Faraday's lectures on the chemistry of a candle,—a series which for models of developing the

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* "Johannes Kepler (1571–1630) was at one time in Prague assistant to the Danish astronomer Tycho Brahe. Unlike Tycho, Kepler had no talent for observation and experimentation. But he was a great thinker, and excelled as a mathematician. He absorbed Copernican ideas, and early grappled with the problem of determining the real paths of the planets. In his first attempts he worked on the dreams of the Pythagoreans concerning figure and number. Intercourse with Tycho led him to reject such mysticism and to study on the planets recorded by his master. He took the planet Mars, and found that no combinations of circles would give a path which could be reconciled with the observations. In one case the difference between the observed and his computed values was eight minutes, and he knew that so accurate an observer as Tycho could not make an error so great. He tried an oval orbit for Mars, and rejected it; he tried an ellipse, and it fitted. Thus, after more than four years of assiduous computation, and after trying nineteen imaginary paths, and rejecting each because it was inconsistent with observation, Kepler in 1618 discovered the truth. An ellipse! Why did he not think of it before? What a simple matter—after the puzzle is once solved! He worked out what are known as Kepler's laws, which accorded with observation, but conflicted with the Ptolemaic hypothesis. Thus the old system was logically overthrown. But not until after a bitter struggle between science and theology did the new system find general acceptation."—Cajori's "History of Physics," pages 29, 30.

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fundamental concepts of chemistry is unsurpassed. The devices used by such teachers are often very suggestive. For instance, in teaching the concept of the new geography that the earth revolves not like a body with a liquid interior, but like a body with an interior as rigid as glass, Lord Kelvin suggests a comparison of the spinning of a hard-boiled egg and of an egg not boiled at all,—an experiment easily made in every school-room.

A few quotations from the astronomer Young will show how concepts of great distances can be developed so as to be more than a numeral with a row of ciphers annexed:

Ideas of great distances.

"If one were to try to walk such a distance, supposing that he could walk four miles an hour, and keep it up for ten hours every day, it would take sixty-eight and one-half years to make a single million of miles, and more than sixty-three hundred years to traverse the whole. If some celestial railway could be imagined, the journey to the sun, even if our trains ran sixty miles an hour, day and night, without a stop, would require over one hundred and seventy-five years. To borrow the curious illustration of Professor Mendenhall, if we could imagine an infant's arm long enough to enable him to touch the sun and burn himself, he would die of old age before the pain could reach him, since, according to the experiments of Helmholtz and others, a nervous shock is communicated only at the rate of one hundred feet per second, or one thousand six hundred and thirty-seven miles a day, and would need more than one hundred and fifty years to make the journey. Sound would do it in about fourteen years if it could be transmitted through celestial space, and a cannon-ball in about nine, if it were to move uniformly with the same speed as when it left the muzzle of the gun. If the earth could be suddenly stopped in her orbit, and allowed to fall unobstructed towards the sun under the accelerating influence of his attraction, she would reach the centre in about two months. I have said if she could be stopped, but such is the compass of her orbit that to make its circuit in a year she has to move nearly nineteen miles a second, or more than fifty times faster than the swiftest rifle-ball; and in moving twenty

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miles her path deviates from perfect straightness by less than one-eighth of an inch." *

Professor Young uses a very suggestive device in his astronomy for showing the comparative sizes and distances of heavenly bodies:

"Representing the sun by a globe two feet in diameter, the earth would be twenty-two-hundredths of an inch in diameter—the size of a very small pea or a 'twenty-two caliber round pellet.' Its distance from the sun on that scale would be just two hundred and twenty feet, and *the nearest star* (still on the same scale) *would be eight thousand miles away at the antipodes.*" †

Sometimes the employment of a new unit aids in realizing the idea of very great distances. The ordinary astronomical unit is the distance of the sun from the earth; it is not large enough to be convenient in expressing the distances of fixed stars. Hence astronomers have found it more satisfactory to take as a unit the distance light travels in a year, which is about sixty-three thousand times the distance of the sun from the earth. The tables of fixed stars give distances in terms of this unit from 3.5 upward. A glance at these figures fills the mind with an idea of the infinite grandeur of the universe and with feelings of awe and sublimity akin to those which must fill the soul on approaching the throne of Almighty God.

Scientists assert that the infinitely great is more easily conceived than the infinitely small; that quantities represented by billions and trillions are more easily grasped than fractions of a unit with a million in the denominator; that ages of time are more easily comprehended than fractions of a second. In a lecture

* Young's "The Sun," pages 43, 44, second edition.

† Young's "Astronomy," page 174.

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delivered at the International Electrical Exhibition, Professor Charles F. Himes employed a very ingenious device for giving an idea of how a "snap-shot" may be made, or a photographic impression taken of an electric spark, or a flash of lightning. He exhibited a photograph of the sparks of a Holtz machine, which are of shorter duration than any instantaneous drop or slide could be made to give. "They impressed themselves upon an ordinary collodion plate as they passed. Suppose we assume one-twenty-thousandth of a second as the time, and we will be within bounds. That is a fraction difficult to comprehend. Our mental dividing engine fails as we work towards zero. The twenty-thousandth of a second is so small that it eludes our mental grasp. . . . Looking at it from another point of view, let us regard the effect as a space-effect instead of a time-effect. Light has a velocity, in round numbers, of one hundred and ninety thousand miles per second. That would be one hundred and ninety miles in one-thousandth of a second, nineteen in one-ten-thousandth, or, say, ten miles in our one-twenty-thousandth of a second. Ten miles of light drive in upon our plate in that time; or, if we held the corpuscular theory of Newton, a chain of these little pellets ten miles long would have delivered themselves upon the sensitive surfaces. Ten miles is comprehensible, one mile is, so that we could easily conceive of an effect in one-tenth of the time allowed to our electric sparks. But let us take another look at it. Light is not corpuscles, but undulations, tiny wavelets, ripplets of ether, eight hundred million million in a second for violet, a number we can easily understand, as Sir William Thomson* has told us. That would make eight hundred thousand

Time of snap-shot.

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*Now the well-known Lord Kelvin.

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million in one-thousandth, eight thousand million in one-ten-thousandth, or forty thousand million impulses striking our sensitive molecules in our one-twenty-thousandth of a second. Surely that number should produce an effect. We can readily conceive that one thousand million wavelets would produce an appreciable effect. They would represent one-eight-hundred-thousandth of a second, say one-millionth of a second. That would seem, then, to be ample time to produce a photographic effect." *

Many teachers of science spend all their spare time in reading scientific literature and in posting themselves upon the latest achievements in their specialty. It might be to them a less delightful occupation if they traversed fields of investigation already well explored for the purpose of seeing how the student can be led over these most expeditiously and with minimum expenditure of time and effort. Thought bestowed upon the best way of imparting the elements of science would have a most beneficial effect upon their methods of instruction, and would greatly increase their skill in teaching. Many of the most abstruse and complex ideas can be resolved by analysis into their elements, and thereby be made intelligible to people of ordinary training. An eminent teacher of theology felt called upon to impart to a promiscuous audience an idea of the doctrine of total depravity as taught by the Church. He started by referring first to the popular mistake that the doctrine teaches the utter depravity of the human race, then to the ancient heresy that the depravity of human nature resides in the body, and not in the soul, and, finally, to the meaning of total as signifying not that man is as bad as he can become,

Idea of total depravity.

* "Actinism," by Professor Charles F. Himes, pages 18, 19.

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but that he is depraved, or has a tendency towards sin not merely in his physical body, but in the totality of his being. Analysis prepared them to see that by total depravity is not meant that men are as bad as they can be, nor that they do not have in their natural condition certain amiable qualities or certain laudable virtues; that the doctrine means that depravity, or the sinful condition of man, infects the whole man,—intellect, feeling, heart, and will,—and that in each unrenewed person some lower affection, and not the love of God, is supreme. Such analysis of a complex concept into its elements, the explicit setting forth what it is and what it is not, followed by the synthesis of the parts into a thought-unit, is the plan pursued by the best teachers in teaching difficult subjects. By analysis we resolve complex concepts into their elements, which may be simple percepts or their relations. Things are separated in thought which go together in time, space, motion, force, or substance. Every essential attribute or constituent can then be viewed by itself until the mind has gone around it with the bounding line of thought, grasped its nature and essence, and explored it in its different aspects and relations. In this way the most abstruse subjects are shorn of their difficulties, the most complex problems are solved and elucidated.

Value of analysis.

The bearing of all this upon the art of teaching is easily shown. A teacher of geometry, whose mind was quite logical, failed, through lack of power, to make things plain. If the class did not grasp the demonstration of a theorem, he invariably started at the beginning, tried to throw light upon every link in the chain of proof, and by the time he reached the point of difficulty the members of the class were thinking of something else. A younger colleague pursued a different plan. Starting some pupil upon the

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demonstration, he detected the difficulty, and by a few words of explanation, or by a well-framed question, he focussed attention upon the simple elements, into which he resolved the difficulty, and frequently surprised the class by showing the simplicity of what had puzzled their minds. Under the clarifying light of analysis half the difficulties and half the sophistries of human thinking vanish like dew and mist before the morning sun.

For the purpose of making an impression upon the moral nature word-painting is sometimes very helpful. The moral nature. All the text-books on physiology and hygiene intended for use in the public schools seek to teach the evils of strong drink by showing the effect of alcoholic stimulants upon different parts of the human system. Yet the most exhaustive lessons on how whiskey is made, and what are its exhilarating and its pernicious effects, cannot equal the effects of the word-painting of Robert Ingersoll and the paraphrase by Dr. Buckley. In making a gift to a friend the former penned the following eulogy on whiskey:

"I send you some of the most wonderful whiskey that ever drove the skeleton from the feast or painted landscapes in the brain of man. It is the mingled souls of wheat and corn. In it you will find the sunshine and the shadow that chased each other over the billowy fields, the breath of June, the carol of the lark, the dew of night, the wealth of summer, and autumn's rich content, all golden with imprisoned light. Drink it, and you will hear the voice of men and maidens singing the 'Harvest Home,' mingled with the laughter of children. Drink it, and you will feel within your blood the starlit dawns, the dreamy, tawny dusks of perfect days. For forty years this liquid joy has been within the staves of oak, longing to touch the lips of man."

This was Dr. Buckley's statement of the other side:

"I send you some of the most wonderful whiskey that ever brought a skeleton into the closet, or painted scenes of lust and

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bloodshed in the brain of man. It is the ghosts of wheat and corn, crazed by the loss of their natural bodies. In it you will find a transient sunshine chased by a shadow as cold as an Arctic midnight, in which the breath of June grows icy and the carol of the lark gives place to the foreboding cry of the raven. Drink it, and you shall have 'woe,' 'sorrow,' 'babbling,' and 'wounds without cause.' Your eyes shall behold strange women, and 'your heart shall utter perverse things.' Drink it deep, and you shall hear the voices of demons shrieking, women wailing, and worse than orphaned children mourning the loss of a father who yet lives. Drink it deep and long, and serpents will hiss in your ears, coil themselves about your neck, and seize you with their fangs; for at the last it biteth like a serpent and stingeth like an adder. For forty years this liquid death has been within staves of oak, harmless there as purest water. I send it to you that you may put an enemy in your mouth to steal away your brains, and yet I call myself your friend."

The languages.

There comes a stage of development of the learner at which the word itself becomes the object of thought. Words are then classified as parts of speech, and their function in sentences is studied. Their properties and endings must be learned and compared. There is abundant room for thought in the eleven hundred variations of the Greek verb. The variations of words by declension and conjugation can be made the material for thought, and as these are always at hand in the text-book, no excursions to the field being needed to secure specimens, and no preparation of difficult experiments being required on the part of the teacher, the ancient languages have held their own in the schools with most wonderful tenacity. The study of language has not merely the advantage of supplying material for thought in the words, grammatical forms, and sentences which are always at hand in the text, but through the classics it brings the learner into intellectual contact with the best thoughts of the best men in ancient and modern times. To translate an author like Vergil or

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Demosthenes is to think the thoughts of a master mind, to weigh words as in a most nicely adjusted balance, and finally to arrange them in sentences that shall adequately convey the meaning of the original text.

Science.

Science is, of course, a product of the human mind, quite as much as the so-called humanities, and answers the same purpose when studied as literature; but then it ceases to have the value of training the intellect in the rigid methods of original research and scientific investigation. Whilst it is the function of the laboratory to initiate the student into the mysteries of the methods by which new discoveries are made and verified, and thus to enable him to avail himself of the labors of others through their publications, it does not bring the student into living contact with human hopes, emotions, and aspirations as do the poems of Goethe, Schiller, and Shakespeare.

History.

History deals with what man has achieved. The materials for thought which it furnishes are mostly in the shape of the testimony of eye-witnesses and other original sources of information. The incidents, the achievements, the struggles, the victories and the defeats, the thoughts, feelings, and experiences of historic personages, are an inexhaustible supply of material from which authors, editors, and orators draw illustrations, figures of speech, and other matter for their thinking. Here is a field which must not be neglected by those who would influence their fellows or figure as leaders of men.

Vigorous thinking.

Some minds are slow at gathering materials; yet they think vigorously. They look at facts and ideas from every possible point of view, explore their nature and relations, their content and extent, and point out their bearing upon other things by the conclusions they reach. Sometimes they go astray

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because they do not have sufficient data to warrant a conclusion. Their condition resembles that of the King of Siam, who did not believe that water could become solid because he had been in the nine points of his kingdom and had not seen ice.

Other men are intellectual gluttons. They keep pouring into themselves knowledge from every quarter, carry it in their minds as the overloaded stomach carries food, and end in mental dyspepsia. Intellectual gluttony. Better the man with few ideas, who can apply these in practical life, than the man of erudition who cannot apply his knowledge.

Too little food produces inanition and starvation; too much food brings on dyspepsia and a host of other ills and distempers. The hap-hazard selection of studies by inexperienced youth from the large list of electives offered by a great university is apt to result either in mental overfeeding or in intellectual starvation. The mind can be rightly formed only when it is rightly informed. To expect satisfactory thought-products when the mind lacks proper materials to act upon would be as irrational as to expect good grist from a flour-mill whose supply of grain is deficient in quality and quantity. In the process of making flour very much depends upon the instruments employed. The rude implements of antiquity, the buhr-stones of our fathers, and the improved machinery of the roller process make a difference in the product, even though the same quality of grain is used. In the elaboration of the thought-material the well-educated man uses instruments which may be likened to our modern inventions for saving labor in the domain of the mechanic arts. These instruments of thought will next claim our attention.

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V

THE INSTRUMENTS OF THOUGHT

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But words are things; and a small drop of ink
Falling, like dew, upon thought, produces
That which makes thousands, perhaps millions, think.

BYRON.

Constant thought will overflow in words unconsciously.

BYRON.

The great Lagrange specifies among the many advantages of algebraic notation that it expresses truths more general than those which were at first contemplated, so that by availing ourselves of such extensions we may develop a multitude of new truths from formulæ founded on limited truths. A glance at the history of science will show this. For example, when Kepler conceived the happy idea of infinitely great and infinitely small quantities (an idea at which common sense must have shaken its head pityingly), he devised an instrument which in expert hands may be made to reach conclusions for an infinite series of approximations without the infinite labor of going successively through these. Again, when Napier invented logarithms, even he had no suspicion of the value of this instrument. He calculated the tables merely to facilitate arithmetical computation, little dreaming that he was at the same time constructing a scale whereon to measure the density of the strata of the atmosphere, the height of the mountains, the areas of innumerable curves, and the relation of stimuli to sensations.

LEWES'S PROBLEMS OF LIFE AND MIND.

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V

THE INSTRUMENTS OF THOUGHT

Of the people who, though inheriting a rich vernacular like the English, spend their lives in the routine of a farm, a trade, or a store, very few have an adequate conception of the labor-saving instruments and appliances which modern civilization places at the disposal of the thinker. The machinery by which one man does as much as a thousand hands formerly did is not a whit more wonderful than the modern appliances for reaching results in the domain of thought. Reference might be made to the machines for adding used in counting-houses, to the tables of interest used by bankers, to the tables of logarithms by which it is as easy to find the one-hundredth power as the square of a number. The last named have, so to speak, multiplied the lives of astronomers by enabling them to make in a short time calculations that formerly occupied months, and even years. It is not necessary to discuss these; their value is apparent at a glance. But the value of a rich vocabulary, the function of the symbols and formulas of chemistry, physics, mathematics, and other sciences, and the advantages derived from the use of the technical terms peculiar to every domain of thought are not so easily seen. The teacher who fails at the right time to put the pupils in possession of these instruments of thought cripples their thinking, wastes their time and effort, and seriously mars their progress. Hence it is worth while to devote a chapter or two to the consideration of instruments of

Labor-saving in thinking.

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thought, for the purpose of showing how, by means of them, thinking is made easier and more effective. Let some one write the amounts in a ledger column by the Roman notation, then endeavor to add them without using any figures of the Arabic notation, either in his mind or in any other way, and he will soon realize what a labor-saving device our ten digits are. Then let him face the problem of squaring the circle as it confronted Archimedes, using the obvious truth that the perimeter of an inscribed polygon is less, while the perimeter of the circumscribed polygon is greater than the circumference of the circle, and long before his calculations reach the regular polygon of ninety-six sides (which is as far as Archimedes carried it), he will realize how the great Syracusan was hampered by the lack of the arithmetical notation now in use. Next, supposing himself in possession of the Arabic method of notation, let him conceive the labor of Rudolph von Ceulen, who, before logarithms were known, computed the ratio of the circumference to the diameter to thirty-five decimal places,—an achievement considered so great that the result was inscribed upon his tombstone,—and then, turning to the calculus, let him examine the formulas by which Clausen and Dase, of Germany, computing independently of each other, carried out the value to two hundred decimal places, their results agreeing to the last figure; this will give him a conception of the superior instruments of thought invented by those who developed the calculus. His idea of the labor-saving devices introduced by the calculus will be heightened still more on learning that Mr. Shanks, of Durham, England, carried the calculation to six hundred and seven decimal places,—a result so nearly accurate that if it were correctly used in calculating the circumference of the visible universe, the possible error would be in-

Squaring the circle.

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appreciable in the most powerful microscope. On further learning that in 1882 Lindeman, of Königsberg, rigorously proved this ratio, commonly represented by the symbol π, to be incapable of representation as the root of any algebraic equation whatever with rational coefficients, he will not only refrain from joining the common herd of squarers of the circle, but no further argument will be needed to show the nature and value of the labor-saving devices introduced into the domain of thought by modern mathematics.

Since it is unreasonable to expect that every reader shall be familiar with higher mathematics, the duty of using simpler illustrations cannot be evaded. Fortunately for the purpose in hand, the book of experience furnishes these with an abundance that is almost bewildering.

A professor of chemistry was lecturing to an audience of teachers on agriculture. When he began to write upon the black-board they smiled at his spelling. Iron he wrote Fe. Water he spelled H_2O. They soon saw that he was using the instruments of thought furnished by a science with which, unfortunately, few of them were familiar. He had found that the use of these chemical symbols made his thinking as much superior to that of the ordinary man as the work of the youth upon a self-binder is superior to that of the giant working with no better instrument than the sickle of our forefathers.

Chemistry.

The school furnishes numerous examples to illustrate this point. When the teachers of a well-known city began the use of objects to impart the ideas of number and of the fundamental rules in arithmetic, the interest of the pupils and their facility in calculation grew wonderfully. The teaching was in accordance with the laws of mental growth. For fear the pupils would manipulate

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the Arabic figures without corresponding ideas, collections and equal parts of objects were drawn upon the slate to illustrate addition and subtraction of integers and fractions. The plan was followed for years and carried upward through the grades. Finally the pupils were examined for admission into the high school. A problem involving the four fundamental rules in combinations which could not be illustrated by pictures of objects, or the objects themselves, was set for solution. Out of fifty-nine applicants, only ten succeeded in giving the correct answer. The same kind of problem was given three times by three different persons, and with practically the same outcome. The teachers realized that they had kept up for too long a time the thinking in things, instead of drilling the pupils upon the process of thinking in the symbols of the Arabic notation. It is, of course, possible to think number without using the Arabic digits. The Romans did so by means of their counting-boards, and the Chinese do so by devices of their own. The characters which were brought into Western Europe through Arabic influences are derived, according to Max Mueller, from the first letters of the Sanskrit words for the first ten numerals. Their use facilitated calculation to such an extent that arithmetic gradually ceased to be the prerogative of slaves and ecclesiastics; its operations began to be understood by freemen and by the nobility. If children are denied the use of objects in their early lessons in number, they resort to counting on their fingers. If they are not led from this thinking on their fingers to thinking in figures, they will never become expert in arithmetic. Sometimes the fingers no longer move, but the mind conceives pictures of the hand, and the mind's eye runs along the fingers of hands not visible to the corporeal eye. It is equally bad if the pupils never

Arabic notation.

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think number except by mental pictures of blocks, sticks, balls, and the like. When the pupil sees 7×9, he should not conceive seven heaps of nine shoe-pegs each, and then a rearrangement into six groups of ten shoe-pegs, and three stray ones alongside of these groups; but instantaneously the symbols 7×9 should suggest, with unerring accuracy, the result,—63.

In the schools of another district the principal proposed concrete work in fractions. The teachers and pupils began to divide things into halves, and thirds, and fourths, and sixths. They added and subtracted by subdividing these into fractions that denoted equal parts of a unit. Whilst the charm of novelty still clung to the process, a stranger who visited the schools asked one of the teachers how the pupils and parents liked the change. "Everybody is delighted," was the exclamation. A year later the same teacher was asked by the visitor, "How are you succeeding with your concrete work in fractions?" With a dejected air she replied, "We are disappointed with the results." "Just as I expected," exclaimed the visitor; "for you were making the children think on the level of barbarism, instead of teaching them to use the tools and labor-saving machinery of modern civilization." Fractions.

Still another incident, taken from actual life, will serve to throw light upon the subject under discussion. In the booming days of the iron industry a laborer had saved and put out at interest twelve hundred dollars. The rate was six per cent., and no interest had been paid for one year and four months. Unable to reckon interest with figures, the toiler asked the principal of the schools to tell him the amount of interest due. Next day he greeted the principal by asking, "Did you not make a mistake in your calculation?" The reply was, "In my hurry to avoid being Reckoning interest.

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late at school I may have made a mistake." He found that the man was right, and curiosity led him to ask how the error had been detected. "I reckoned it," said the man. This aroused still greater curiosity; for the principal knew that, beyond the ability to count, the man had no knowledge of arithmetic. By agreement they met on Saturday afternoon, so that the man might show his method of reckoning interest. At the appointed hour the man laid six pennies on the floor to denote a year's interest on one dollar, and then laid two pennies alongside of these as the additional interest on a dollar for four months. The supply of pennies being exhausted, he made strokes with chalk, and proceeded to do this twelve hundred times, and then to count them for the purpose of ascertaining the interest. It was thinking in things with a vengeance. And yet the making of strokes with chalk was a step in symbolic representation, and shows the innate tendency of the human mind to use symbols in thinking.

Even the words used in counting are symbols. In fact, every word that signifies anything is a symbol used by the mind to indicate an idea more or less complex, as well as the thing or things or relation of things in the external world which corresponds to the idea. In advanced thinking the words denote ideas more and more complex as the problems grow in difficulty or involve more of the abstract and general concepts under which the mind classifies the objects of which it takes cognizance. This is more largely true of the words in a developed language than it is of a dialect with little or no literature. A reference to the writer's early home will be pardoned in this connection. His father, a plain farmer in Eastern Pennsylvania, sent four sons through college and gave each of them a professional or university education.

Words.

Dialects.

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When they gather under the parental roof they use the dialect of their early days in discussing life on the farm and in rehearsing the funny experiences of their boyhood; but when they discuss a question in science or mathematics, in law, medicine, or theology, they drop the dialect of their boyhood and use the instruments of thought furnished by languages having a literature. Some one has facetiously said of one town in the Lehigh Valley that the people pray in seven languages and swear in eight. It is a witty statement of an actual fact. The Welshman can pray as well as swear in his native tongue. The Pennsylvania German can vent his feelings fully in his own dialect when he grows profane. As soon as he says his prayers he reverts to the language of the pulpit and of Luther's Bible because he there finds the words which express the deepest wants and emotions of the human soul.

Melanchthon.

When Melanchthon prepared the Saxony school plan he insisted that pupils should read Latin, write Latin, and speak Latin to the exclusion of the mother tongue. If an educator of to-day should advocate this policy in the fatherland, he would be banished. Melanchthon, surnamed preceptor Germaniæ, knew what he was about. He taught at a time when teachers of the humanities lamented that children were born in the homes of parents speaking German. He lectured at a time when Luther and his colleagues were visiting market-places to talk with the peasants for the purpose of gathering words and phrases by which the New Testament might be adequately rendered in the vernacular of the common people. A development extending over one hundred and fifty years was required before the lecturers at the universities found in it enough words and phrases to serve as instruments of thought for purposes of ad-

Growth of the German language.

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vanced investigation and ratiocination. So rich and flexible has the German become that Voss succeeded in translating Homer into German, using the same metre, the same number of lines, without adding to or subtracting from the ideas of the original. Schlegel's translation of Shakespeare is equally famous and equally successful. Both of these masterpieces show how essential a rich vocabulary is in rendering or in reproducing the best thoughts of the best minds; they show the importance of linguistic development and linguistic teaching.

Value of a rich vocabulary.

For purposes of thought and culture a rich mother tongue is of untold advantage. It is a great blessing to be born and raised in a home presided over by a well-educated mother. It is an invaluable help to be trained in schools whose teachers speak and write the languages which have felt the touch of the genius of Shakespeare and of Goethe. Next to furnishing ideas or something to think about, the thing of most importance in teaching a pupil to think is to enrich his vocabulary, to train him in language. Dr. Whewell has well remarked that "language is the atmosphere in which thought lives, for there is hardly a subject we can think about without the aid of language. Consequently, without knowledge of the language of a science all thinking with regard to that science is impossible; for although we conceive the world by means of our senses, we comprehend it only in and through the form of language." In this connection one cannot do better than listen to the conclusions of men who have attained eminence as scholars, thinkers, and writers. Speaking from experience, they can throw light upon the art of correct and efficient thinking.

"Language, we must remember," says Dr. Morrell, "is not constructed afresh by every individual mind which uses it. It is a world already created for us,—

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one into which we have simply to be introduced, and in which the process of human development, up to any given period, is more or less perfectly preserved and registered. Recollection, accordingly, by enabling us to appropriate to ourselves a whole system of signs, with the ideas attached to them, initiates us insensibly into the intellectual world of the present, puts us upon the vantage-ground of the latest degree of civilization, and enables us to grasp the ideas of the age without the labor of thinking them out consecutively by our own individual effort." * Dr. Morrell.

"Language," says Dr. Whewell, "is often called an instrument of thought; but it is also the nutriment of thought; or, rather, it is the atmosphere in which thought lives; a medium essential to the activity of our speculative power, although invisible and imperceptible in its operation; and an element modifying, by its qualities and changes, the growth and complexion of the faculties which it feeds. In this way the influence of preceding discoveries upon subsequent ones, of the past upon the present, is most penetrating and universal, though most subtle and difficult to trace. The most familiar words and phrases are connected by imperceptible ties with the reasonings and discoveries of former men and most distant times. Their knowledge is an inseparable part of ours; the present generation inherits and uses the scientific wealth of all the past. And this is the fortune not only of the great and rich in the intellectual world, of those who have the key to the ancient storehouses and who have accumulated treasures of their own, but the humblest inquirer, while he puts his reasoning into words, benefits by the Dr. Whewell.

* Dr. Morrell's "Elements of Psychology," quoted by Galloway in "Education, Scientific and Technical," page 165.

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labors of the greatest discoverers. When he counts his little wealth, he finds he has in his hands coins which bear the image and superscription of ancient and modern intellectual dynasties; and that, in virtue of this possession, acquisitions are in his power, solid knowledge within his reach, which none could ever have attained to if it were not that the gold of truth, once dug out of the mine, circulates more and more widely among mankind." *

"The word 'vernacular,'" says Hinsdale, "is derived from *vernaculus*, which comes from *verna*, a slave born in his master's house; and it means the speech to which one is born and in which he is reared,— the *patrius sermo* of the Roman, the *Mutter-sprache* of the German, the mother tongue of the Englishman. Command of a noble vernacular involves the most valuable discipline and culture that a man is capable of receiving. It conditions all other discipline and culture. . . . The greatest mental inheritance to which a German, a Frenchman, or an Englishman is born is his native tongue, rich in the knowledge and wisdom, the ideas and thoughts, the wit and fancy, the sentiment and feeling, of a thousand years. Nay, of more than a thousand years; for these languages, in their modern forms, were enriched by still earlier centuries. To come back to the old thought, such a speech as one of these only flows out from such a life as it expresses, and is in turn essential to the existence of that life." †

Dr. Hinsdale.

Parents who wish their children to possess the best instruments of thought cannot be too careful in the selection of teachers for them. Children whose mother tongue

* Quoted by Galloway in "Education, Scientific and Technical," pages 116, 117.

† Hinsdale's "The Language Arts," pages 17, 18.

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is a dialect should be trained in one or more of the languages that have been enriched by centuries of development and literary culture. The best that the people of Pennsylvania-German extraction can do for future generations is to make the transition as speedily as possible from their vernacular—so poverty-stricken in its vocabulary—to the English, with its abundant vocabulary and its unsurpassed literary treasures. In the English they will find the instruments of thought fitted to develop native powers that have been inherited from an ancestry of sturdy husbandmen, and strengthened through heredity by centuries of contact with the soil, even as the giant Antæus, in wrestling with Hercules, is fabled to have gained new strength as often as he came in contact with mother earth. The same advice will apply to the other nationalities who have come to live on American soil, even though they have brought with them a more developed vernacular. The English dictionary contains one hundred and twenty thousand words; but besides these words in common use, the dictionaries of the specialists contain several hundred thousand more, which may be called technical terms, and which serve as instruments of thought in scientific discussions and investigations. To these we next turn our attention.

English.

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VI

TECHNICAL TERMS AS INSTRUMENTS OF THOUGHT

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It is the power of thinking by means of symbols which demarcates men from animals, and gives one man or nation the superiority over others.

LEWES.

Hardly any original thoughts on mental or social subjects ever make their way among mankind or assume their proper importance in the minds even of their inventors until aptly selected words or phrases have, as it were, nailed them down and held them fast.

J. S. MILL.

Though most readers, probably, entertain, at first, a persuasion that a writer ought to content himself with the use of common words in their common sense, and feel a repugnance to technical terms and arbitrary rules of phraseology, as pedantic and troublesome, it is soon found by the student of any branch of science that, without technical terms and fixed rules, there can be no certain or progressive knowledge. The loose and infantine grasp of common language cannot hold objects steadily enough for scientific examination, or lift them from one stage of generalization to another. They must be secured by the rigid mechanism of a scientific phraseology. This necessity has been felt in all the sciences, from the earliest periods of their progress.

WHEWELL.

Ideas and existences are represented by terms and phrases; and as terms and phrases are representative of thoughts and things, and are the means which enable us to speak about them, the definitions, descriptions, and explanations of terms form a very necessary part of science; and he who would understand science must learn the meaning of the special terms employed in it.

GORE.

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VI

TECHNICAL TERMS AS INSTRUMENTS OF THOUGHT

SOME teachers are very much afraid of technical terms. They teach their pupils to say name-word instead of noun, action-word instead of verb, and bring over instead of transpose. There is no end to the phrases they invent for the sake of avoiding technical terms. Acting on the maxim that a pupil shall never be allowed to use a word without comprehending its meaning, they prefer to use compound words and phrases to denote the fundamental ideas of the various branches of study. This fear of technical terms is a natural result of the reaction against rote teaching. So much has been said and written against the teaching of mere words, especially big words, against parrot-like recitations of definitions, rules, principles, and forms of statement given in the text-book or wrought out by the teacher, that many people fail to see the value of technical terms as instruments of thought. A separate chapter is necessary to point out their function in scientific thinking and instruction. In common parlance the use of technical terms should be avoided. Do we say that Nebuchadnezzar had a long noun or a long name? Noun is a technical term; name is the word in ordinary use. Do we say that a man broke his femur or his leg? The doctors who set the limb will probably use

Technical terms.

Their value.

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the technical term in their conferences. In talking with the common people they use the common names, unless they wish to awe the multitudes by a show of learning. Often, indeed, men use big words to hide their ignorance. In physiology the investigations are carried as far as possible, and then a term is coined to cover the unknown. Often high-sounding words are strung together to cover a lack of ideas or to establish a reputation for erudition. These are tricks to which a genuine teacher has no occasion to resort. It is his duty to ascertain the educational value of the technical terms of science, and to use these terms for the purpose of fixing scientific ideas in the mind and of causing the pupil to think clearly and exactly.

At the basis of every science, as we have seen, there are certain ideas which cannot be conveyed to other minds by the use of the corresponding technical terms.

Basal concepts.

These basal concepts must be built up in the learner's mind by skilful teaching, sometimes by the very process by which the race acquired or discovered them. It may require a trip to the field, to the museum, or to the mine; or an experiment in the laboratory may be necessary. Perhaps a development lesson is needed to enable the pupil to grasp the idea clearly and fully. It is very certain that if the idea is hazy and ill-defined, the subsequent thinking will be loose, obscure, and unsatisfactory. The glib use of technical terms may often hide from the teacher the defects of the pupil's thinking, and it may require an examination to reveal the points wherein the teacher has failed. Questions which require a pupil to look at his knowledge from a new point of view are helpful; an examination abounding in such questions may be an intellectual blessing to both teacher and pupil. The examiner should, of course, avoid puzzling catch-questions, for these are calculated to embarrass the pupil and confuse his thinking.

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A clear thinker can always make his ideas intelligible to those who have acquired the basal concepts of the things, principles, and laws with which he deals. Lecturers on popular science avoid the abstruse questions of advanced science and the technical terms which do not convey a definite meaning to the average hearer. They select topics which can be discussed in the language of common life, and often state the results of scientific research without leading the audience through the successive steps by which these results are obtained. The popular lecture requires special gifts that are not in the possession of every scientist. Huxley was one of the most gifted men of the century; yet he says of himself,— Popular lectures.

"I have not been one of those fortunate persons who are able to regard a popular lecture as a mere *hors d'œuvre* unworthy of being ranked among the serious efforts of a philosopher, and who keep their fame as scientific hierophants unsullied by attempts —at least of the successful sort—to be understanded by the people. On the contrary, I have found that the task of putting the truths learned in the field, the laboratory, and the museum into language which, without bating a jot of scientific accuracy, shall be generally intelligible, taxed such scientific and literary faculty as I possessed to the uttermost; indeed, my experience has furnished me with no better corrective of the tendency to scholastic pedantry, which besets all those who are absorbed in pursuits remote from the common ways of men, and become habituated to think and speak in the technical dialect of their own little world, as if there were no other." Huxley.

There is an error, on the other hand, into which practical men fall when they object to the technical language of the scientist. There are many things in science which

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cannot be made plain to the non-scientific mind. The difficulty lies not in the terminology employed, but in the lack of the basal concepts necessary for the advanced thinking which must be employed. Says Robert Galloway, "Words when employed in science, unlike their employment in common use, have a meaning steadily fixed and precisely determined; this precision in the meaning of scientific terms necessarily requires on the part of those who can make proper use of them *accurate habits of thought;* this is an indispensable qualification for attainment in any science; there is no dispensing with it, consequently one who does not know the language of a science, and who has not been taught to think accurately with respect to it, cannot understand properly what may be told or shown him about the facts or principles of that science."

Exact thinking.

From this point of view it is easy to see the use which the teacher should make of technical terms. Circumlocutions and explanatory phrases may be helpful in developing fundamental ideas, but the corresponding technical terms should be associated with the ideas as soon as these assume clear, definite shape. Language is the atmosphere in which thinking lives; technical language is as necessary to the scientific thought as the air we breathe is to the physical life. In one of his letters to a young man whose education had been neglected, De Quincey renders an important service to the science of teaching. "In assigning to the complex notion X the name transcendental, Kant was not simply transferring a word which had previously been used by the school-men to a more useful office; he was bringing into the service of the intellect a new birth; that is, drawing into a synthesis, which had not existed before as a synthesis, parts or elements which exist and come forward hourly in every man's mind. I

De Quincey.

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urge this upon your attention, because you will often hear such challenges thrown out as this (or others involving the same error): 'Now, if there be any sense in this Mr. Kant's writings, let us have it in good old mother English.' That is, in other words, transfer into the unscientific language of life scientific notions which it is not fitted to express. The challenger proceeds upon the common error of supposing all ideas fully developed to exist *in esse* in all understandings, ergo, his own; and all that are in his own he thinks we can express in English. Thus the challenger, in his own notions, has you in a dilemma, at any rate; for, if you do not translate it, then it confirms his belief that the whole is jargon; if you do (as, doubtless, with the help of much periphrasis, that will be intelligible to a man who already understands the philosophy), then where was the use of the terminology? But the way to deal with this fellow is as follows: My good sir, I shall do what you ask; but before I do it I beg you will oblige me by (1) translating this mathematics into the language of chemistry; (2) translating this chemistry into the language of mathematics; (3) both into the language of cookery, and, finally, solve me the Cambridge problem, Given the captain's name, the year of our Lord, to determine the longitude of the ship? This is the way to deal with such fellows."

Technical terms are very helpful in dealing with that which cannot be imaged or visualized. When Francis Galton began his inquiries into the power possessed by different minds to conceive the breakfast table, to recall vividly the various dishes and the way in which they are placed upon the table, many men of scientific habits of thought declared that there is no such human faculty. On the other hand, the educational reformer whose early training did not make him familiar

Images.

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with the thought-processes of higher mathematics may honestly declare that he cannot conceive an abstract number, and, as a matter of course, he can have no adequate conception of the value of the higher forms of thinking in symbols. Dr. W. T. Harris has well said that the mind can think ideas which cannot be pictorially conceived or made to stand before the mind in thought-images. In thinking this class of ideas, technical terms are indispensable as instruments of thought.

Higher forms of thinking.

The value of technical terms as instruments of thought is seen in a still clearer light if we try to classify the various uses of the signs and symbols which are employed as aids in thinking. Many of these have no office beyond that of *suggesting* the things or ideas for which they stand. To this class belong the marks which suggest to the tramp a cross dog or a good meal. As soon as he has seen them, they could be erased; the train of thought which they started in his mind can go on without them. Of a similar character are the devices by which the merchant marks the buying and the selling prices of goods, the red and blue lights used on railways and ocean steamers, the secret signs and signals employed by the signal corps of an army, and the steps, grips, signs, countersigns, and passwords employed by secret societies as a means of identification. Very many of the artificial devices used in systems of mnemonics have no higher function than that of suggesting what otherwise might be forgotten.

Symbols classified.

Suggestive symbols.

Very different are the signs and symbols which mathematics employs as substitutes for the quantities to be considered. In adding a column in the ledger or in a statistical table the mind thinks the figures without reference to the concrete objects which

Symbols as substitutes.

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they denote. In the solution of a problem in algebra the unknown quantities are represented by symbols like x and y, the known quantities by the first letters of the alphabet or by numerical expressions; the relations between the quantities are indicated by equations; there is no thought of the quantities themselves while the mind is engaged in manipulating the symbols according to well-defined rules of operation, and only when the result is to be interpreted do the quantities reappear in the field of consciousness. The substitute symbol is a device for temporarily dropping an idea until it is needed for interpretation; the suggestive symbol is a means of bringing an idea or thought into the domain of consciousness. The latter furnishes or recalls material for the mind to act upon; the former lightens the burden which the mind would otherwise have to carry. The arithmetical solution of an age question in which the mind constantly carries the thought of A's age and his wife's age as compared with the algebraic solution of the same question in which A and his wife, as well as their ages, sink temporarily out of sight, shows the value of substitute signs and symbols in mathematical thinking, and explains why algebraic methods are so far superior to the clumsy and involved methods of arithmetical analysis.

Different from either of these is the class of symbols used in expressing ideas. This class includes not only the words of written and spoken language, but also the natural signs of gesture language and the conventional signs of manual language taught to deaf mutes. The language is full of faded metaphors indicating the office of common words. They are said to express meaning, to convey thought, to embody ideas, to enshrine content. They may be likened to window-panes through which one sees what is back of

Expressive symbols.

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them. Sometimes the window-panes, like spectacles when first worn, attract more attention from the person looking than the objects seen through them,—a parallel to what occurs when the articulate speech, or its rhetorical adornment, attracts more attention than the thought expressed. But if that which is seen through the window-pane is on the order of a Santa Claus loaded with toys and Christmas-gifts, then no notice is taken of the medium through which the object is seen. Hence the very best teaching—that which rivets attention upon the thought conveyed—always fails to teach the spelling of words incidentally. Furthermore, the instruction which frequently stops to draw attention to the grammar of the sentences, the spelling of the words or their mode of utterance, interferes with the formation of logical habits of thinking and divests the words of their function as expressive signs. When the word itself becomes an object of thought the mind is not thinking by means of that word. It has been well said that we may fail to apprehend the meaning of what a person is saying because the tone of his voice arrests our attention through its resemblance to that of some one else in whom we feel an interest; that so far as signs thus attract notice on their own account, they fail to fulfil their function as a means of attending to something other than themselves. For this very pertinent observation credit is due to Mr. G. F. Stout, who ("Mind," lxii. page 18) has very clearly drawn the distinction between the three classes of signs or symbols used as helps in thinking. He says,—

G. F. Stout.

"Suggestive signs serve only to bring something to mind; they are not a means of minding it when once recalled. An expressive sign, on the contrary, is a means of attending to its signification. . . . Expressive signs differ from substitutes in a manner

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exactly the inverse of that in which they differ from suggestive signs. A suggestive sign has fulfilled its purpose and becomes of no further avail so soon as it has suggested its meaning. A substitute sign is a counter which takes the place of its meaning; so long as it fulfils its representative function it renders useless all reference to that which it represents. The counters are manipulated according to certain rules of operation until a certain result is reached, which is then interpreted. The operator may be actually unable to interpret the intermediate steps. Algebraical and arithmetical symbols are to a great extent used as mere substitute signs. The same is true of the symbols employed in formal logic. It is possible to use signs of this kind whenever fixed and definite rules of operation can be derived from the nature of the things symbolized, so as to be applied in manipulating the signs without further reference to their signification. A word is an instrument for thinking about the meaning which it expresses; a substitute sign is a means of not thinking about the meaning which it symbolizes."

In addition to these three purposes the technical term may serve still another important end. It helps to fix the new concept or notion after it has been developed by skilful instruction. Its association therewith makes it a suggestive sign whenever occasion requires the recurrence of the concept or thought for which it stands. The train of thought is facilitated and made possible by the use of technical terms as expressive signs. And if the idea denoted by it can be defined accurately, so that the definition becomes a triumph of intellect, or if it can be quantified, so as to become a unit of measure like the volts, ohms, ampères, and watts in applied electricity, the technical term may even serve a purpose analogous to the substitute signs in sciences like formal logic and mathematics.

Fixing concepts.

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The foregoing analysis indicates the proper method of teaching technical terms. First, the basal concept should be carefully developed and clearly presented; it should then be fixed in the mind by association with the corresponding technical term; finally, the union should be made permanent by frequently causing the two to appear together in the domain of thought, by treating them as welcome guests when they appear together in the citadel of mind. Divorce of one from the other should be as impossible as in the case of the two parties to a suitable marriage. On the *fête* days of science they should appear together, each suggesting the presence of the other, the technical term serving as a helpmeet to the idea, and as its representative when, in the charmed circle of scientific investigation, the presence of the idea is not absolutely required. Circumlocutions, like name-word for noun, quality-word for adjective, and relation-word for preposition, may be helpful in presenting the idea or in introducing the technical term; they may be tolerated, like a third party in the making of a match; but when the match has been made, and the wedding has been solemnized, they should drop out of sight as of no further use. The figure of speech could easily be pressed too far; for many objects known to science have a common as well as a technical designation. Each has its proper place in the realm of thought,—the common name in ordinary conversation, the technical term when scientific precision is required.

Proper use of technical terms.

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VII

THOUGHT AND LANGUAGE

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It seems to me quite certain that we can and do think things without thinking of any sound or words. Language seems to me to be necessary to the progress of thought, but not at all necessary to the mere act of thinking. It is a product of thought: a vehicle for the communication of it, a channel for the conveyance of it, and an embodiment which is essential to its growth and continuity. But it seems to be altogether erroneous to represent it as an inseparable part of cogitation. Donkeys and dogs are without true thought, not because they are speechless, but they are speechless because they have no abstract ideas, and no true reasoning powers. In parrots the power of mere articulation exists sometimes in wonderful perfection. But parrots are not so clever as many other birds which have no such power.

Man's vocal organs are correlated with his brain. Both are equally mysterious, because they are co-operative, and yet separable, parts of "one plan."

ARGYLL.

That the language may be fitted for its purpose, not only should every word perfectly express its meaning, but there should be no important meaning without its word. Whatever we have occasion to think of often, and for scientific purposes, ought to have a name appropriated to it.

J. S. MILL.

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VII

THOUGHT AND LANGUAGE

In the development of intellectual life three contingencies are possible.

Three possible contingencies.

1. The growth of the vocabulary may be more rapid than the acquisition of ideas.

2. The accumulation and development of ideas may exceed the ability to express them in language.

3. The acquisition of ideas and words, of thought and language, may be simultaneous.

Without doubt, these possibilities in mental growth exist for wise and beneficent purposes.

The tendency to acquire words without the corresponding ideas is, in at least one direction, a source of gain rather than loss. The pert phrases, profane words, and other objectionable language which the child accidentally hears from the lips of older persons, and at times uses to the unspeakable annoyance of parents and teachers, would be an occasion for far more serious alarm if the meaning were fully understood. Were it a law of our mental life that the hearing and learning of a profane or obscene word necessarily carried with it a clear grasp of the meaning, the resulting harm to the inner life of the soul would be immeasurably greater, and the stain upon the character would be vastly more difficult to remove. The objectionable language may mirror the habits of thought and speech into which those in charge of the child have fallen, awaken in them a new sense of their responsi-

Words without ideas.

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bility, and cause them to be more careful of what they say; or it may prove an index to the kind of company into which the child is drifting, and thus serve as a danger-signal to parent and teacher. When the mind has not learned to think the thought expressed, a simple warning against the use of such ugly words generally suffices to eradicate them from the child's vocabulary; and in such instances it is a blessing in disguise that the learning of the words was not accompanied by the acquisition of their meaning. The loss to the intellectual life is more than balanced by the gain in moral training.

Thinking without words.

Is thinking possible without language? If by language is meant oral speech and written words, the sign-language of deaf mutes is sufficient to compel an affirmative answer to the question. Moreover, there are modes of thinking and of expressing thought other than by the use of words. Of the means of expressing thought without words, symbols like the ten digits and the sigma of the new psychology are well-known examples. The player in a game of chess, croquet, or billiards thinks movements in advance of making them, and generally without describing the same in words. The drawings and plans by means of which the architect designs a new building, the mental images of mechanical contrivances which precede the invention and construction of machines, the mental pictures used in designing, engineering, and sketching, in original geological thought, prove beyond the shadow of a doubt that thinking may go forward without words and sentences, and may find expression in ways better adapted to the needs of the artisan. The graphic method of presenting to the eye the results of an investigation is less cumbersome than any description in words. Some men depend so much upon mental pictures in their thinking that they assert they cannot think at all without them.

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In some kinds of gymnastic drill the movement is described in words, then conceived by the mind, and finally executed. This exercise has a different educational value from the exercise in which the student simply imitates the movements of the teacher, the latter being an instance of thinking and expressing thought without the help of words. The speed with which many movements must be executed, as in fencing, legerdemain, athletic sports, the manipulation of the lever in the hands of the engineer, requires thinking without the intermediate agency of words and sentences. The time it takes for an idea to pass into words, and through them into actions, is measurably greater than the time required for the direct translation of thought into action. Although the difference in specific instances is measured by the fraction of a second, it would involve serious loss of time as well as energy in the handicrafts if thoughts could only pass into action through speech or written language.

Some persons run to mouth; others lack in this respect. To the former class belong those whose lips move in study; those who talk to themselves; and many whose paucity of ideas does not justify their superfluity of words. Let such a man be elected as a delegate to a synod or a convention, and the sessions will be prolonged beyond the usual time. As a rule, the energy of such men is exhausted in speech; they are not noted for getting things done. On the other hand, the men of great executive ability are oftentimes men of few words; their thought is translated into doing rather than talking. The man of deeds is always estimated above the man of words, the general above the orator, Cæsar the commander above Cæsar the orator. Sometimes the men of original turn of mind find that their thinking outstrips

Superfluity of words.

Thought and action.

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their power to express thought. Francis Galton says of himself, "It is a serious drawback to me in writing that I do not so easily think in words as otherwise. It often happens that after being hard at work and having arrived at results that are perfectly clear and satisfactory to myself, when I try to express them in language I feel that I must begin by putting myself on quite a different intellectual plane; I have to translate my thoughts into a language that does not run evenly with them. I therefore waste a great deal of time in seeking for appropriate words and phrases, and am conscious, when required to speak on a sudden, of being often obscure through mere verbal maladroitness, and not through want of clearness of perception. This is one of the small annoyances of my life. I may add that often while engaged in thinking out something I hatch an accompaniment of nonsense-words, just as notes of a song might accompany the thought. Also, that after I have made a mental step, the appropriate word frequently follows as an echo; as a rule, it does not accompany it."

Francis Galton.

This throws a new light upon one phase of school work. The boy who has a notion of the content of a lesson sometimes stops in the midst of a recitation and, without premeditation, exclaims, "I know it, but cannot say it." The teacher retorts, "You do not know what you cannot express." Both are right and both are wrong. There is, probably, a measure of truth in what each claims. If the pupil had mastered the text, he would not only have a clear idea of the lesson, but he would also have acquired from the book or from the teacher the words to express the idea. Nevertheless, if there is reason for thinking that the pupil has devoted reasonable time to the lesson, his linguistic powers should be developed by questions and

Knowing and telling.

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other appropriate help. The good sense and native instincts of most teachers lead them to give this help. The teacher whose captious disposition issues in remarks calculated to repress a backward pupil's powers of expression should find employment outside of the school-room.

Foreign-born children.

The child of foreigners may outstrip native children and astonish the school by unprecedented progress because, being already familiar with the ideas of the lesson, it is compelled simply to acquire the language by which the ideas are expressed. By reason of their inability at first to tell what they know, such children are often classified with those less mature, and the mastery of the new language in their case is not as difficult as the mastery of new ideas for which brain-growth may be the essential condition. To ignore the fact that such children often know more than they can tell is pedagogic folly in the highest degree.

Language clarifies thought.

Courses of study are sometimes mapped out so as to cause inequality in the pace with which ideas are accumulated and language is developed. Undue stress on grammar, rhetoric, and belles-lettres may cause abnormal development in the direction of flowery language, a verbose style, an ornate diction. It is a fault difficult to correct. To insist that such a student shall have something to say, to force him into studies that will bring him face to face with great questions as yet unsettled, to beget in him a state of mind in which he is troubled with ideas, to compel him to work over and over what he writes until his sentences are as clear as crystals, seems necessary to counteract the one-sided development of such students. The curriculum of study may err on the other side. The graduates in the various courses of engineering (civil, electrical, mechanical, and mining) sometimes develop technical, to the neglect of linguistic, skill. In the pres-

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ence of a body of capitalists they are made deeply conscious of the difference between the ability to think and the ability to express thought.* In one large school of technology the graduates established prizes in English composition and endowed chairs of the English language and literature, so that future students might acquire the power to state in clear and intelligible language the results of their work as specialists. In no long time it was discovered that for this purpose they also needed training in an art similar to that of the teacher,—namely, the art of developing the ideas and thoughts which underlie and condition the engineering project under consideration. For him who would be a leader among men, the ability to express thought is quite as important as the ability to think. Moreover, there is a vast difference between ability to express thought on one's feet in the presence of an audience and ability to express it on paper in the privacy of the home. J. J. Rousseau and Washington Irving could write well, but neither of them could make a speech. Patrick Henry's eloquence before an audience was unsurpassed; he never could write a satisfactory report. Power in both directions may be acquired in a college course through the exercises of a good debating society. The student who, during four years, carefully writes out his thoughts, then discards his manuscript while speaking, and studies how he can best convince his hearers and how he can prune

* Mr. Smiles, "Life of Stephenson," third edition, page 474, tells how George Stephenson, arguing one evening on the coal question with Dr. Buckland, was quite unable to make good his case. The next morning he talked over the matter with Sir W. Follett, and that illustrious advocate, from the materials supplied by the practical knowledge of Stephenson, was able easily to discomfit the learned dean. Quoted by A. S. Wilkins's "Cicero de Oratore," page 105, second edition.

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himself of the defects pointed out by the merciless criticism of his fellows, can feel sure of ultimate success. President Barnard says of one of our largest institutions that half its glory departed when its literary societies were killed through the influence of the Greek letter fraternities. A public speaker who is a slave to his manuscript is deserving of pity. College authorities may well exercise their ingenuity in finding a substitute for the drill and practice which the literary societies of by-gone days afforded in learning to think and to express thought in the face of opposition, criticism, and other unfavorable conditions.

Literary societies.

Thought and language exercise a reciprocal influence. Thought is stimulated and clarified by the effort to express it. Often it is shaped by the limitations of one's vocabulary and the range of the words with which one's hearers or readers are familiar. The faded metaphors of language betray us into fallacies. Phrases like the witness of the spirit, total depravity, have led to extravagant expectations and unwarranted conclusions. People sometimes have a religious phraseology without a corresponding religious experience, and hence deceive themselves and others. Everywhere we see instances that go to show how important it is that the development of the power to think should keep pace with the growth of the power to express thought. Very much is said in these days about the use of good English. As Adam threw the blame upon Eve, and Eve cast it upon the Serpent, so every one blames some one else for the poor English used at school and college. In the end the teachers are usually made to bear most of the blame: the college professor blames the teachers in the high school; these, in turn, blame the teachers in the lower grades; and when the matter is cast up to the primary teacher,

Influence of language upon thinking.

Teaching English.

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she throws the blame upon the street and the home. A professor in the college department of a university gave many ludicrous specimens of English in the work handed to him by students. He was asked of what college class he had charge, and when he replied the sophomore, a high-school teacher suggested that the specimens reflected quite as much upon the teachers of the freshman class as upon the schools below the university.

A women's society in one of our large cities sent a committee to the superintendent to complain of the poor English used by the children in the schools. He agreed that strenuous efforts should be made to provide a remedy. He added, "If you will take care of the English in the homes and on the streets, I will get the teachers to look after the English in the schools." Instead of throwing blame upon others, it were far more sensible for each educated person to ask wherein he is to blame for setting others a bad example and wherein he can help the teachers of English to accomplish the desired result.

The committee.

The aim in teaching English is twofold,—first, to get the student to appreciate good English and good literature; secondly, to get him to use it in speaking and writing. The latter end cannot be reached by mere practice in essay-writing. Ability to think is a condition of ability to express thought. Too many of the subjects assigned lay stress upon the forms of speech and not upon the content of language. When pupils think in words and disconnected phrases rather than sentences, when they violate the rules for capitals, punctuation, and paragraphs, the teachers of English may be solely to blame; but, in so far as the use of good English depends upon good thinking, the blame for the use of faulty language rests upon all who teach. If the ability to think is not developed in proportion to the

Aim.

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use of language, the school will produce stylists who exalt the forms of speech above their content, slaves of beautiful and flowery language who resemble the fops and dudes of social life. To emancipate from such slavery requires more than an emancipation proclamation from the president of a college association.

The labors of the brothers Grim, Max Müller, and others have reduced the knowledge of language to a science. Linguistic studies have become as interesting as any branch of natural science. They shed new light upon the history of mankind. In furnishing material for thought, as well as mental discipline, they are not inferior to any other study in the curriculum. It would, however, be a mistake to suppose that philological studies are superior to other disciplines as means for developing power to think and power to express thought. The professor of any language is apt to regard that language as an end, and not as means to an end. Primarily, language is a medium of communication. It distinguishes man from the brute creation, and furnishes him the instruments of thought by which he carries forward processes of reasoning beyond the reach of the lower animals. At the university language in general, or any particular language, may be studied as a specialty, and can thus be made an end in itself as appropriately as any other subject which is studied for its own sake. In the lower schools language should always be made tributary to the art of thinking. It should be employed to embody thought, and to convey thought, without intruding itself upon our attention as the thing of chief value. Any phase of linguistic study may be lifted by an enthusiastic teacher into the chief place in the course of study. Orthography has sometimes been taught as if it were the chief end of man to spell correctly. Grammar has been

Linguistic studies.

Language tributary to thinking.

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taught as if a faulty sentence were one of the sins forbidden by the Decalogue, and as if the fate of the republic depended upon parsing, analysis, and diagramming. The pronunciation of words may be emphasized until the lips of teacher and pupil smack of an overdose of dictionary, until the overdoing of obscure vowels draws attention away from the thought to the manner of utterance. A sensible man articulates his words in such a manner as readily to be understood, but never in such a way as to excite remark or draw the mind of the listener from the subject-matter of the discourse.

In educational practice, the manner of expressing the thought should not supplant the more important art of making the pupil think. Getting and begetting thought are of more consequence than the expression of thought; in fact, they condition the correct use of language. All talk about English, or German, or Spanish, or Latin, or Greek, as if any one of these languages were an end in itself for the average pupil, is wide of the mark. Correct sentences, beautiful expressions, and rhetorical phrases can never make a nation great or perpetuate its free institutions. Flowery language can never save a dying sinner or console the widow who is following the bier of a son, her only child and support. Fine words never win a battle by land or by sea. The most eloquent orations against Philip of Macedon did not keep him from destroying the liberties of Greece.

Correct and forceful language is a gift to be coveted, a prize worth striving for; but it should never be made the all-absorbing aim of education. The teacher of any phase of language must for a time make his instruction the object of chief concern; but he should never ignore the fact that language is and ever should be an aid to thought, a stimulus to thinking, an embodiment of ideas, a medium of communication, a means to an end.

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VIII

THE STIMULUS TO THINKING

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Good methods of teaching are important, but they cannot supply the want of ability in the teacher. The Socratic method is good; but a Socrates behind the teacher's desk to ask questions is better.

THOMAS M. BALLIET.

Of all forms of friendship in youth, by far the most effective as a means of education is that species of enthusiastic veneration which young men of loyal and well-conditioned minds are apt to contract for men of intellectual eminence in their own circles. The educating effect of such an attachment is prodigious; and happy the youth who forms one. We all know the advice given to young men to "think for themselves;" and there is sense and soundness in the advice; but if I were to select what I account perhaps the most fortunate thing that can befall a young man during the early period of his life,—the most fortunate, too, in the end, for his intellectual independence,—it would be his being voluntarily subjected for a time to some powerful intellectual slavery.

DAVID MASSON.

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VIII

THE STIMULUS TO THINKING

WHILST the distinction between thinking in things and thinking in symbols should never be ignored or lost sight of by the teacher, it need not be brought to the attention of the learner,—at least not in the elementary stages of instruction. It is more profitable for the learner to be absorbed in gathering the materials of thought and in learning by practice how the educated man uses the instruments of thought for drawing correct conclusions by the most effective methods. If the eye of consciousness is turned inward upon the mental processes too early, the flow of thought is interrupted and turned away from its logical trend. The teacher, on the other hand, is expected to watch the growth of the mind, to awaken its powers, and to rouse these into vigorous activity. It is essential not merely that he furnish the pupils with the proper materials and the best instruments of thought, but it is necessary also to stimulate and direct their thinking; otherwise that which is given them may overload the memory, lie undigested in the mind, exhaust the energy of the intellect in the effort at retention, and ultimately cause mental dyspepsia.

Thought stimulus.

Men engaged in the struggle for existence or preferment usually find ample stimulus to their thinking faculties in the competition which real life affords. If the merchant does not think accurately and effectively, the consequences make themselves visible in his bank-account. The desire for gain is the stimulus to thought in the commercial world. An appeal to the same motive is often made through the offer of

Competition.

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prizes and fellowships. The competition of maturer years finds an adumbration in the competition for class-standing and for superiority in field sports. The teacher who employs no higher stimulus to thought must be a stranger to the mysteries of the art which he professes to practise. The best device for stimulating thought has come down to us hallowed by the ages. It bears the name of the greatest teacher of ancient Athens. It is the question as employed in the Socratic method. Not every question is the Socratic question. A man who has lost his way may ask a question, but it is for the sake of getting information. The teacher may be striving to fix in the memory the salient points of the lesson: he asks questions, the answers to which the pupils are expected to have at their tongue's or fingers' end. A question thus used for purposes of drill is often called a categorical question. It is not the Socratic question. Yonder sits a boy who for half an hour has been wrestling with a problem. Unable to find a clue to the solution, he asks the teacher for help. Instead of telling him directly what he wishes to know, the Socrates behind the teacher's desk asks a question which causes the pupil to put side by side in his mind two ideas never before linked together in his thought. Upon the learner's face is seen an expression as if light had broken in from on high. He goes back to his seat, and ere five minutes have elapsed he is rejoicing in the glory of a triumph. The teacher did not do the pupil's thinking; he simply asked the Socratic question, which aims to make the pupil think for himself.

Socratic question.

This stimulus to thought is employed by every master in the art of teaching. The question may be used to badger and confuse a pupil, especially if the teacher is not fully acquainted with the ideas and thoughts already in the learner's mind. To cause each pupil to place side

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by side in his mind ideas and concepts whose relation he had not before perceived, it is necessary that the teacher be familiar with the intellectual storehouse of every member of the class. At this point the substitutes who occasionally supply the places of regular teachers are at a serious disadvantage. Not knowing what the pupils have mastered, they must often waste time in finding out where the new should be linked to the old, and where it is necessary to clarify and develop ideas with which the members of the class are only partially familiar. Often these lose interest in the recitation while the new teacher quizzes them on things that have grown stale by repetition.

Substitute teachers.

Back of the Socratic method must be a Socrates to ask the questions. Education results not from highly differentiated methods, but primarily from the play of mind upon mind, heart upon heart, will upon will. In the difficult art of making others think the most important factor is the teacher himself. Thinking begets thinking. In this connection one cannot forbear contrasting the living teacher with other educational forces. Treatises on education are in the habit of printing nature with a capital letter, whilst words like teacher, humanity, unless they stand at the beginning of the sentence, begin with a small letter. Are lifeless rocks, dead leaves, stuffed birds, and transfixed bugs more potent in begetting thought than the teacher himself? If nature were such a wonderful teacher, then the savage, who is in daily contact with nature, and who knows little or nothing of the artificial life of our great cities and great seats of learning, should be the best thinker. A teacher whose power to stimulate thought is not superior to dead leaves and bugs and butterflies must have reached the dead line. Teachers may be divided into two classes,—those who have ceased

The living teacher.

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to grow and those who are still alive and growing. Under the tuition of the former the boy soon loses interest in study, and seldom acquires the power to think. From a dead tree you cannot propagate life. Ingraft a lifeless teacher upon the school; the most skilful devices of school management and recitation serve only to intensify the dull routine, the mechanical iteration and repetition which Bishop Spalding declares to be the most radical defect in our systems of education. It takes life to beget life. A growing mind is required to beget growth in other minds. A good thinker begets habits of close and careful thinking in those whom he moulds. Some minds are more gifted in this respect than others. Without doubt the reader can recall the difference between knowledge and teaching power which he felt while under several instructors at the same time. From those gifted with stimulating power he came away with a mind full of interrogation points, and with the attention riveted upon problems calling for investigation. Under their tuition the commonest things acquired new interest and became food for thought. The thinking seemed to spring out of that upon which the mind was feeding. Without the stimulating influence which comes from a live teacher, contact with nature, access to libraries and laboratories, may amount to very little. The chief trouble in our schools is not that the courses of study are too crowded, but the teachers are too empty. There is not enough fuel in their minds to keep alive the glow of thought. A course of study in the hands of a skilful instructor is like a good bill of fare under the direction of a skilful caterer. The latter does not expect every guest to eat his way through the entire bill of fare; he so manages the succession of dishes as to stimulate the appetite to the end of the feast; he sends

The dead line.

Knowledge and teaching power.

The course of study.

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the guests away without the feeling of satiety,—in fact, anxious for the next banquet. The wise teacher does not expect the pupils to assimilate everything in the course of study; he aims so to feed and stimulate their minds that they find genuine pleasure in thinking, and go away from him with a desire not only for more knowledge, but also for things that give suitable exercise to the reflective powers. Watch a boy at work upon a puzzle, and you will be convinced that he finds genuine delight in thinking that which is difficult. The most popular teachers are not they who smooth away every difficulty in the pathway of the student, but they who stimulate his thinking and help him to a sense of mastery over intellectual difficulties. The quickening, stimulative influence of the Socratic question lies in its content rather than its form; and both form and content derive their vivifying power from the personality of the teacher.

Difficulties.

The stimulating influences which go forth from a live teacher are partly conscious and partly unconscious. The latter are the more effective. Minds gifted with quickening power create about themselves an intellectual atmosphere that is like the invigorating atmosphere of the mountains or the tonic breezes which blow from the sea. The woman who touched the hem of the Saviour's garment felt at once the vivifying influences which were all the time going forth from the Great Teacher. Here we stand face to face with the greatest mystery of the teacher's art.

Conscious and unconscious influences.

Some light is shed upon the mystery by the intimate relation which exists between the conscious and the subconscious life of the soul. The ideas upon any subject which the individual cherishes during his conscious moments, the train of logical thinking which he pursues when the will gives direction to reflection, the creative

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effort which he seeks to put forth in a given direction,—these shape the activities which go forward in the depths of the soul when perhaps the attention is directed to the discharge of routine duties. "Out of the heart are the issues of life." "Out of the fulness of the heart the mouth speaketh." From the treasure-house of the heart come welling up thoughts, ideas, sentiments, and purposes which largely determine the influence exerted upon others when the individual is not aware of it. The teacher must make himself what he wishes his pupil to be. If foot-ball and base-ball and boating form the staple of his thinking, the centre of his affections, these athletic sports, in ways that are marvellous and often past finding out, become the objects of thought in which his students will delight. If the truths and principles of science absorb his interest and engage the best thought of his conscious hours, these will determine the moulding influence which he will unconsciously exert upon others. If he delights in germ-ideas, in seed-thoughts, these will emanate from him whenever he is thrown into contact with inquiring minds. Much, of course, is due to native ability, to inherited qualities. The circle of minds which one teacher can reach is further limited by the breadth or narrowness of his views, by the points which he has in common with others, by the amount of sympathetic interest which he manifests in their progress and welfare, by the sum total of the characteristics of generic humanity which he has taken up into himself. In other words, his stimulating power depends upon the extent to which his inner life is representative of the best thought and the best traits of the age in which he lives and of the people to whom he belongs.

The heart.

A teacher may destroy his power to awaken and stimulate thought by developing every subject in all its

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bearings to its logical or final conclusion. He should send his classes away from the daily lecture or recitation to the library or the laboratory, to the study, the shop, or the field, with the sense of something to be achieved, with the feeling that there are fields of research for them to explore, fields that will amply repay careful study, investigation, and reflection. There is nothing that tires a boy so soon as the feeling that there is nothing for him to do, nothing that he can master, achieve, or conquer on his own account. The normal child is so constituted that it loves activity, looks into the future, and regards itself as an important factor in the world's life. The advance from childhood to youth is marked by a transition into the period that is brimful of hope and ambition. The pampered son of a rich man may feel no longing of this sort; his opportunities for early travel and premature indulgence in every whim may have brought him to the point where the whole world seems like a sucked orange for which one has no further use. Unless the rich father and mother possess an extraordinary amount of good sense, their children do not have an even chance with the children of the middle classes whose outlook upon life supplies abundant motives for study and exertion.

Exhaustive treatment.

Hope.

If a boy has not made a mistake in selecting his parents, if the atmosphere of the home in which his first six years are spent is normal, he comes to school with a sense of something to be achieved. Should this feeling be lacking, the true teacher will aim to beget it by the instruction he gives and by appeals to the innate desire for knowledge. As the intelligence dawns, the interrogation points on the boy's face multiply; his appetite for knowledge grows by what it feeds on. If the branches of study do not become more interesting than any occupation by which the boy can earn coppers, there is some-

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thing wrong either with the boy or his teacher, or with both. In the ascent of the hill of science every step upward widens the horizon, increases the field of vision, and stimulates to new effort. Every field explored beckons to new fields of investigation. It is the prerogative of the teacher to point out what is in store for the aspiring youth. Take, for instance, the domain of pure mathematics. A pupil had learned in his geometry that parallel lines never meet. The teacher told him that his geometrical studies would after a while acquaint him with lines that are not parallel and yet never meet. No sooner had he met lines of this kind, situated in different planes, than his teacher told him of lines that continually approach but never meet. The appeal to his curiosity helped to stimulate the desire for knowledge and kept him thinking earnestly and seriously until he met the asymptote and its curve. The study of asymptotes soon grew more interesting than chess or any sports upon the athletic field.

The field of vision.

The aim of the teacher should be to make himself useless. In other words, the school should aim to lift the pupil to the plane of an independent thinker, capable of giving conscious direction to his intellectual life and of concentrating all his powers upon anything that is to be mastered. It is to be reckoned a piece of good fortune for a bright and talented youth to fall under the dominating influence of a master mind. In endeavoring to walk in the footsteps of an intellectual giant, to comprehend his theories and speculations, and to carry the burden of his thoughts, unexpected strength and power are developed, and when the day of emancipation comes—as it always does come in the case of gifted youth—the learner will find that he has entered a higher sphere of intellectual activity, and will henceforth rank among the world's productive thinkers.

Master minds.

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As was said at the beginning of the chapter, the competition of men in mature life is usually sufficient to stimulate their thinking. The men whose duties make a constant drain upon their productivity need other forms of thought-stimulation. Reference is not here made to the narcotics, alcoholic stimulants, and other drugs which brain-workers use in periods of reaction and fatigue: these stimulate only for a short time, and leave the nervous system and the brain weaker than before; they shorten life by burning the candle at both ends; they cannot supply the need of sleep, rest, and recreation. To take rational exercise, to eat proper food, and to obey all the laws of health is the sacred duty of every person who teaches by word of mouth or pen. Every effort should be made to keep vitality at its maximum. Often the mind resembles the soil which yields a richer harvest if permitted to lie fallow for a time. If at the close of a period of rest or a summer vacation the mind refuses to work, what shall then be done to stimulate mental activity? Different men derive stimulus from different sources. One finds help from taking a pen in hand, another by facing a sea of upturned faces. A clergyman of considerable repute uses an Indian story to start his mental machinery. Henry Ward Beecher declared that the greatest kindness which could be shown him was to oppose his public utterances. Opposition roused all his powers and helped him to think vigorously and to the best advantage. Schiller is said to have kept rotten apples in his desk, because he believed that the odor stimulated his mind. Some men find help in solitude, from the singing of birds, from the sound of rustling leaves and falling waters, from the noise of ocean waves, or from the glimpse of distant waters or far-off mountains. An eminent theologian is

False stimulants.

Mental lethargy.

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stimulated by the playing of a piano in the next room. The stimulus from books is reserved for discussion in a separate chapter on the Right Use of Books.

Hinderances.

As there are helps, so there are hinderances to good thinking. Petty cares, executive duties, noises in the same room, or in the next room, or upon the street, are well-known examples. Their name is legion, and their cost is enormous if they come from manufacturing establishments near the school. A word about the extra-mural music which emanates from vile machinery on the streets is not out of place in this connection. An English writer asserts that the organ-grinders of London have done more in the last twenty years to detract from the quality and quantity of the higher mental work of the nation than any two or three colleges at Oxford have effected to increase it. A mathematician estimates the cost of the increased mental labor these street-musicians have imposed upon him and his clerks at several thousand pounds' worth of first-class work, for which the government actually paid in added length of the time needed for his calculations.

In matters of this kind every man must be a law unto himself. Since no two human beings are exactly alike, but each is a new creation fresh from the hands of the Creator, it follows that each person must study his own peculiarities, form his own habits of work, and acquire the power to think in the midst of the circumstances in which he is placed. By resolute effort the mind can ignore many a hinderance and distraction. The best stimulus from without comes from our fellow-men. "Our minds need the stimulus of other minds, as our lungs need oxygen to perform their functions." At school the stimulus comes from classmates, from those in the higher and lower classes, but above all else, from the best books and the best teachers. In the

Our fellow-men.

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life beyond the school the stimulus comes from the daily contact and competition with others, from conversation and discussions with those who think, from communion with the best books, with nature, and with nature's God.

After the powers of the mind have been awakened and disciplined, stimulus and inspiration may come from ten thousand sources. Silence and solitude, city and country, business and pleasure, observation and travel, observatories and laboratories, libraries and museums, nature and art, poetry and prose, fiction and history, may each in turn serve as a spur to creative, inventive, and productive thinking, as an incentive to original research, fruitful investigation, and profitable reasoning. Among all the sources of stimulation, the good teacher and the good book take superlative rank.

Sources of stimulus.

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IX

THE RIGHT USE OF BOOKS

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Even the very greatest of authors are indebted to miscellaneous reading, often in several different languages, for the suggestion of their most original works, and for the light which has kindled many a shining thought of their own.

HAMERTON.

He reads a book most wisely who thinks everything into a book that it is capable of holding, and it is the stamp and token of a great book so to incorporate itself with our own being, so to quicken our insight and stimulate our thought, as to make us feel as if we helped to create it while we read. Whatever we can find in a book that aids us in the conduct of life, or to a truer interpretation of it, or to a franker reconcilement with it, we may with a good conscience believe is not there by accident, but that the author meant we should find it there.

LOWELL.

Much as a man gains from actual conflict with living minds, he may gain much even of the same kind of knowledge, though different in detail, from the accumulated thinking of the past. No living generation can outweigh all the past. If books without experience in real life cannot develop a man all round, neither can life without books do it. There is a certain dignity of culture which lives only in the atmosphere of libraries. There is a breadth and a genuineness of self-knowledge which one gets from the silent friendship of great authors without which the best work that is in a man cannot come out of him in large professional successes.

PHELPS.

The great secret of reading consists in this,—that it does not matter so much what we read or how we read it as what we think and how we think it. Reading is only the fuel; and, the mind once on fire, any and all material will feed the flame, provided only it have any combustible matter in it. And we cannot tell from what quarter the next material will come. The thought we need, the facts we are in search of, may make their appearance in the corner of the newspaper, or in some forgotten volume long ago consigned to dust and oblivion. Hawthorne in the parlor of a country inn on a rainy day could find mental nutriment in an old directory. That accomplished philologist, the late Lord Strangford, could find ample amusement for an hour's delay at a railway station in tracing out the etymology of the names in Bradshaw. The mind that is not awake and alive will find a library a barren wilderness.

CHARLES F. RICHARDSON.

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IX

THE RIGHT USE OF BOOKS

A CLERGYMAN who found the reaction from his pulpit efforts so great that often he could not bring himself to think vigorously and consecutively before the middle of the following week was advised by his physician to try the effect of an Indian tale or an exciting story, and found that a good novel works like a charm in bringing the mind back to normal action. After the interest in the story or novel begins to grow there is danger of reading too long, of reading until another spell of fatigue and reaction comes. The book should be laid aside as soon as the first glow of mental action is felt.

A novel.

Most thinkers need the stimulating influence of other minds. These can be found at their best upon the shelves of a well-selected library. They are ready to help us whenever we feel ready to give them our attention. Men put the best part of themselves into their books. The process of writing for print intensifies mental activity, spurs the intellect to the keenest, most vigorous effort, and arouses the highest energy of thought and feeling. Authors that exert a quickening influence upon our thinking should be kept for use whenever we need a stimulus to rouse the mind from its lethargy.

Books.

Leibnitz got his best ideas while reading books. He had acquired the habits of a librarian to whom favorite volumes are always accessible.

A scientist of repute says he gets the necessary stimu-

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lus from Jevons's treatise on the inductive sciences. Professor Phelps has collected an instructive list of authors whose writings have been helpful to other authors of note. He says,—

As stimulus

"Voltaire used to read Massillon as a stimulus to production. Bossuet read Homer for the same purpose. Gray read Spenser's 'Faerie Queene' as the preliminary to the use of his pen. The favorites of Milton were Homer and Euripides. Fénelon resorted to the ancient classics promiscuously. Pope read Dryden as his habitual aid to composing. Corneille read Tacitus and Livy. Clarendon did the same. Sir William Jones, on his passage to India, planned five different volumes, and assigned to each the author he resolved to read as a guide and awakener to his own mind for its work. Buffon made the same use of the works of Sir Isaac Newton. With great variety of tastes successful authors have generally agreed in availing themselves of this natural and facile method of educating their minds to the work of original creation." *

Examples.

The most valuable function of standard authors lies in their quickening influence upon the intellectual life. The effort to appropriate their ideas and to master their thoughts is the best possible exercise for the understanding. In thinking their thoughts, weighing their arguments, and following their train of reasoning the mind gains vigor, strength, and the capacity for sustained effort. The invigorating atmosphere which a great thinker creates has a most remarkable tonic effect upon all who dwell in it. By unconscious absorption they acquire his spirit of inquiry, his methods of research, his habits of investigation, his way of attacking and mastering difficulties. While trying to walk in

Great thinkers.

* Phelps's "Men and Books," page 303.

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his footsteps they learn to take giant strides. His idioms, his choice of words, his favorite phrases and expressions are at their service when they enter new fields of truth. Both in power and aspiration they become like him through the mysterious process of mind acting upon mind, of heart evoking heart, and of will transfusing itself into will. A great thinker gets his place in the galaxy of shining intellects through the truths which he communicates; and as truth is the best food for the soul, so the quest of truth is the best exercise for all its faculties.

The literature of knowledge and the literature of power.

De Quincey, in his essay on Alexander Pope, draws an important and oft-quoted distinction between the literature of knowledge and the literature of power. He says the function of the one is to teach, of the other to move. The former he likens to a rudder, the latter to an oar or a sail. To illustrate the difference he asks, "What do you learn from 'Paradise Lost'? Nothing at all. What do you learn from a cookery-book? Something new, something that you did not know before, in every paragraph. But would you, therefore, put the wretched cookery-book on a higher level of estimation than the divine poem? What you owe to Milton is not any knowledge, of which a million separate items are still but a million of advancing steps on the same earthly level; what you owe is *power*,—that is, exercise and expansion to your own latent capacity of sympathy with the infinite, where every pulse and each separate influx is a step upward, a step ascending, as upon Jacob's ladder, from earth to mysterious altitudes above the earth. All the steps of knowledge, from first to last, carry you farther on the same plane, but could never raise you one foot above your ancient level of earth; whereas, the very first step in power is a flight, is an ascending into another element where earth is forgotten."

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The value of the literature of power as a means of imparting power to every soul that lives under its influence is easily seen and generally acknowledged. But the literature of knowledge serves the double purpose of furnishing us material for thought and of acting as a stimulus to thought. On this point we have the testimony of the wisest who have ventured to give advice upon the use of books. Lowell says, "It is certainly true that the material of thought reacts upon the thought itself. Shakespeare himself would have been commonplace had he been padlocked in a thinly shaven vocabulary, and Phidias, had he worked in wax, only a more inspired Mrs. Jarley."

Lowell.

The advice which Lowell gives concerning a course of reading and the ends of scholarship to be kept in mind by those who read with a purpose is too valuable to be omitted in this connection:

"One is sometimes asked by young people to recommend a course of reading. My advice would be that they should confine themselves to the supreme books in whatever literature, or, still better, to choose some one great author and make themselves thoroughly familiar with him. For, as all roads lead to Rome, so do they likewise lead away from it, and you will find that in order to understand perfectly and to weigh exactly any vital piece of literature you will be gradually and pleasantly persuaded to excursions and explorations of which you little dreamed when you began, and will find yourselves scholars before you are aware. For, remember, there is nothing less profitable than scholarship for the mere sake of scholarship, nor anything more wearisome in the attainment. But the moment you have a definite aim, attention is quickened, the mother of memory, and all that you acquire groups and arranges itself in an order that is lucid, because

His advice.

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everywhere and always it is in intelligent relation to a central object of constant and growing interest. This method also forces upon us the necessity of thinking, which is, after all, the highest result of all education. For what we want is not learning, but knowledge; that is, the power to make learning answer its true end as a quickener of intelligence and a widener of our intellectual sympathies. I do not mean to say that every one is fitted by nature or inclination for a definite course of study, or, indeed, for serious study in any sense. I am quite willing that these should 'browse in a library,' as Dr. Johnson called it, to their heart's content. It is perhaps the only way in which time may be profitably wasted. But desultory reading will not make a 'full man,' as Bacon understood it, of one who has not Johnson's memory, his power of assimilation, and, above all, his comprehensive view of the relations of things. 'Read not,' says Lord Bacon, in his 'Essay of Studies,' 'to contradict and confute; not to believe and take for granted; nor to find talk and discourse; but to weigh and consider. Some books are to be tasted, others to be swallowed, and some few to be chewed and digested; that is, some books are to be read only in parts; others to be read, but not curiously (carefully), and some few to be read wholly and with diligence and attention. *Some books, also, may be read by deputy.*'

"This is weighty and well said, and I would call your attention especially to the wise words with which the passage closes. The best books are not always those which lend themselves to discussions and comment, but those (like Montaigne's 'Essays') which discuss and comment ourselves." *

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* Lowell's "Books and Libraries," pages 88–90, vol. vi., *Riverside Edition.*

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Professor Phelps, in his lectures to divinity students, gives golden advice to the class of professional men whose life-work compels them to draw upon their productive intellect more than any other class of professional men.

"There is an influence exerted by books upon the mind which resembles that of diet upon the body. A studious mind becomes, by a law of its being, like the object which it studies with enthusiasm. If your favorite authors are superficial, gaudy, short-lived, you become yourself such in your culture and your influence. If your favorite authors are of the grand, profound, enduring order, you become yourself such to the extent of your innate capacity for such growth. Their thoughts become yours not by transfer, but by transfusion. Their methods of combining thoughts become yours; so that on different subjects from theirs you will compose as they would have done if they had handled those subjects. Their choice of words, their idioms, their constructions, their illustrative materials become yours; so that their style and yours will belong to the same class in expression, and yet your style will never be merely imitative of theirs.

Phelps.

"It is the prerogative of great authors thus to throw back a charm over subsequent generations which is often more plastic than the influence of a parent over a child. Do we not feel the fascination of it from certain favorite characters in history? Are there not already certain solar minds in the firmament of your scholarly life whose rays you feel shooting down into the depths of your being, and quickening there a vitality which you feel in every original product of your own mind? Such minds are teaching you the true ends of an intellectual life. They are unsealing the springs of intellectual activity. They are attracting your intellectual aspirations. They are like voices calling to you from the sky.

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"Respecting this process of assimilation, it deserves to be remarked that it is essential to any broad range of originality. Never, if it is genuine, does it create copyists or mannerists. Imitation is the work of undeveloped mind. Childish mind imitates. Mind unawakened to the consciousness of its own powers copies. Stagnant mind falls into mannerism. On the contrary, a mind enkindled into aspiration by high ideals is never content with imitated excellence. Any mind thus awakened must, above all things else, be itself. It must act itself out, think its own thoughts, speak its own vernacular, grow to its own completeness. You can no more become servile under such a discipline than you can unconsciously copy another man's gait in your walk or mask your own countenance with his." *

"Give to yourself a hearty, affectionate acquaintance with a group of the ablest minds in Christian literature, and if there is anything in you kindred to such minds, they will bring it up to the surface of your own consciousness. You will have a cheering sense of discovery. Quarries of thought original to you will be opened. Suddenly, it may be in some choice hour of research, veins will glisten with a lustre richer than that of silver. You will feel a new strength for your life's work, because you will be sensible of new resources." †

There are two ways of reading books,—one a help to thinking, the other destructive of ability to think. If the reader allows the ideas of a book to pass through his mind as a landscape passes before the eye of a traveller, ever seeking the excitement of something new and never stopping to reflect upon the contents of the book so as to weigh its arguments, to

Two ways of reading.

* Phelps's "Men and Books," pages 105, 106.

† Ibid., page 124.

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notice its beauties, and to appropriate its truths, the book will leave him less able to think than before. Passive reading is permissible when the aim is merely recreation, but he who would read to gain mental strength must read actively, read books that he can understand only as the result of effort. President Porter gives this advice:

President Porter.

"The person, particularly the student, who has never wrestled manfully and perseveringly with a difficult book will be good for little in this world of wrestling and strife. But when you are convinced that a book is above your attainments, capacity, or age, it is of little use for you, and it is wiser to let it alone. It is both vexing and unprofitable to stand upon one's toes and strain one's self for hours in efforts to reach the fruit which you are not tall enough to gather. It is better to leave it till it can be reached more easily. When the grapes are both ripe and within easy reach for you, it is safe to conclude that they are not sour." *

Reading as a source of material.

There are many phases of the library problem which do not call for consideration in this connection, but, in addition to their value as a stimulus to thinking, the function of books in furnishing proper material for thought and suitable instruments of thought deserves special consideration on the part of those charged with the duty of teaching others to think. There was a time when libraries were managed as if it were the mission of the librarian to keep the books from being used. The modern librarian seeks to make accessible to all the accumulated wisdom of the past. He regards the library as a storehouse of knowledge, from which any one able to read can get what he needs. Cyclopædias and dictionaries of reference, card

* N. Porter's "Books and Reading," page 57.

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catalogues, and helps like Poole's "Index to Periodical Literature" make the best thought of the best minds in these and other days accessible to the student. He who wishes to gain a hearing on any theme must know what others have said upon it. Disraeli has well said that those who do not read largely will not themselves deserve to be read. The prize debates between different colleges are teaching students how to utilize books in getting material for public discussions. Theses for graduation develop the ability to use books in the right way. And yet, valuable as books are for furnishing fuel to the mind, they may be used to destroy what little ability to think a pupil has otherwise developed. To assign topics for composition which require a culling of facts from books, and to allow the essays to be written outside of school hours, expose the pupil to unnecessary temptations. In the public schools there should be set apart each week several periods of suitable length, during which the pupil, under the eye of the teacher, writes out his thoughts. In such exercises the attention should not be riveted upon capitals, spelling, punctuation, grammatical construction, and rhetorical devices; the mind should be occupied solely and intensely with the expression of the thought. Mistakes should be corrected when the pupil reviews and rewrites his composition. Books can be used to furnish material for thought; the elaboration can be helped by oral discussions; the interest thereby aroused will make each member of the class anxious to express his thoughts; hesitation in composing and distraction from dread of mistakes can be overcome by making the class write against time.

Enriching one's vocabulary.

Books are helpful in enriching one's vocabulary. Treatises on rhetoric teach what words should be avoided. The student finds more difficulty in getting enough words to express his thoughts. The study

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of a good series of readers is more valuable as a means of acquiring a good vocabulary than all the rules on purity, propriety, and so forth, which are found in the text-books on rhetoric. A good series of school readers employs from five to six thousand words. With these the average teacher is familiar to the extent of knowing their meaning when he sees them in sentences. He does not have a sufficient command of a third of them to use them in writing or speaking. The selections of a Fifth Reader contain more words than are found in the vocabulary of any living author. The step from knowing a word when used by another to the ability to use that word in expressing our own thoughts has not been taken in the case of the larger proportion of the words with which we are familiar on the printed page. Most persons use more words in writing than in oral speech, more words in public speaking than in ordinary conversation. We unconsciously absorb many words which we hear others use, but we pick up a far larger number from those we see in print simply because the printed page contains a larger variety of words than spoken language. In this respect there is a vast difference between the oral discourse and the written manuscript of the same person. The style is different; the sentences in oral discourse are less involved; the diction is less complicated; the vocabulary is less copious. Hence the advantage of the boy who has access to standard authors over the youth who has access to few books, and these not well selected. Without any effort, the former gains possession of a vocabulary which makes thinking easier and richer.

School readers.

The lack of a library of standard authors can be supplied, to some extent, by a judicious use of the school readers. If the mastery of the words and the getting of the thought precede the oral reading of the lesson, and if the vocal utterance is followed by oral

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and written reproduction of the thought, correct habits of study will be formed, and the working vocabulary of teacher and pupil will be vastly increased. The habit of eying every stranger on the printed page will be fixed, and the appropriation of new words will rise above the subconscious stage. Only one other exercise is comparable, —namely, the comparison of words in a lexicon for the purpose of selecting the right one in making a translation from some ancient or modern language. Such translations, if honestly made, enrich the vocabulary and furnish exercise in the study of the finer shades of meaning which words have, as well as in the use of the words for the purpose of expressing thought.

Most persons, when they face an audience or feel at all embarrassed, think in phrases, in broken sentences. Hence exercises designed to cultivate the habit of thinking in sentences are very valuable. Franklin's plan of rewriting the thought of a book like "The Spectator," and then comparing his own sentences with those of a master-mind, can be followed with great advantage, because it lifts the burden of correction from the teacher's shoulders and throws it upon the pupil, giving the latter the full benefit of the exercise. Moreover, it cultivates in the pupil the habit of watching how thought is expressed by standard authors. The teacher's interest in the thought side of language often makes him forget that the correct use of capitals, punctuation marks, sentences, and paragraphs is a matter of thinking quite as much as invention and the arrangement of materials. These externals of the process of composing must at some time be made the object of chief regard. The reason so many pupils do not learn their use is found in the fact that teachers hate the drudgery of correcting papers, and they expect the pupils to acquire this knowledge incidentally.

Franklin's plan.

Correcting papers.

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The right use of books obviates the necessity for much of this drudgery, and secures the desired end with a minimum expenditure of time and effort. Skill in the use of capitals and punctuation marks is best acquired when the attention is not absorbed by the elaboration of ideas or by the labor of composing. The externals involved in putting sentences upon paper can claim the chief attention in the dictation of standard selections from a school reader. This exercise enables the pupil to make his own corrections, and is worth a dozen in which the teacher makes the corrections, only to be cast aside after a momentary glance by the pupil. The exercise may be varied by copying a selection from a standard author upon the black-board, covering it with a screen or shade (on rollers) during the dictation, and exposing it to view only while the corrections are made. If each one of the punctuation marks is made an object of special attention in a particular grade, there are enough grades to cover them all before the pupil reaches the high school.

A superintendent revolutionized the language-work of an entire county by dictating to the applicants at the annual examination for provisional certificates a selection from a First Reader for the purpose of testing their knowledge of capitals and punctuation and the other details of written speech. Every one saw the value of the test, and it led to a study of the school reader from a new point of view.

Dictation.

It is not easy to overestimate the value of books, not merely for those who aspire to become thinkers, but even for all classes of men in civilized life. Books treasure the wisdom of the ages and transmit it to future generations. They kindle thought, enliven the emotions, and lift the soul into the domain of the true, the beautiful, and the good. They fur-

Books for all.

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nish recreation and instruction, comfort and consolation, stimulation and inspiration. They confirm or correct the opinions already formed, and give tone to the entire intellectual life. They enlarge the vocabulary, exemplify the best methods of embodying thought in language, and show how master-minds throw their materials into connected discourse, how they organize facts, truths, inferences, and theories into systems of science or speculation. One can subscribe to all that is said in favor of object-teaching and laboratory methods, and still be consistent in maintaining that it should be one of the chief aims of the school to teach the right use of books, that the college and university fail in their mission if they neglect to put the student into the way of using a library to the best advantage. If the policy of many schools were adopted in other fields of human activity, the folly would be too glaring to escape notice. Suppose, by months of effort, a botanist could create in his son a liking for the plants of the nightshade family, some of which, like the potato and the tomato, are good for food and others are poisonous. Having created the appetite, the father makes no effort to gratify it. The son, failing to distinguish between the good and the bad, the esculent and the poisonous, and finding the latter within easy reach, begins to gratify his appetite by eating without discrimination. The deadly effects are more easily imagined than described.

Right use of books.

A parallel folly has been committed in hundreds of communities which have taxed themselves to banish illiteracy and to make ignorance impossible among the young people. Reading is carefully taught; the ability to read is followed by an appetite for reading; a strong desire for the mental food derived from the printed page is created. Yet nothing is done to supply the right kind of books for the purpose

Good literature.

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of gratifying this appetite. The average youth is allowed to get what he can from the book-stalls, which contain much that is as deleterious to the soul as some plants of the nightshade family are to the body. It is as much a duty to supply proper literature as it is to impart the ability to read. When, in the twentieth century, some historian shall give an account of the educational development of Pennsylvania, he will record it as a fact passing strange and well-nigh incapable of explanation that for more than three decades there stood upon the statute-books of a great commonwealth a law preventing boards of directors from appropriating any school funds to the purchase of books for a school library except such works of a strictly professional character as were necessary for the improvement of the teachers. Within the last decade a new era has dawned in library legislation and in the purchase of books. Directors are now empowered to levy a tax for library purposes, and free libraries are springing into existence not only in the large centres of population, but even in the rural schools. The movement has come not a whit too soon; for habits of reading are sadly needed to supplement life in the factory and on the farm. To make from day to day nothing except the head of a pin, or the sixtieth part of a shoe, may develop marvellous skill and speed in workmanship, but such division of labor leaves little room for intellectual activity or for anything above the merest mechanical routine.

It should not occasion surprise that operatives in factories seek the mental excitement which human nature always craves after hours of monotony. Far better that they should find recreation in a good book than in a game of cards, in a free library than in a drinking-saloon. That the workman may taste the joys of the higher life of thought, it is essential that he have access to the best literature in prose and poetry,

The factory.

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to books of travel, biography, history, science, and sociology. If he lack these, his mind will lose itself in local gossip, in discontent over his lot, in envy of those who have more to eat and drink, better clothes to wear, and better houses to live in. Of the pleasures of the higher life he can have as many as, if not more than, others have; for at the close of the day his mind is not exhausted by professional thinking, and he can enjoy a good book far more than the men whose daily occupation obliges them to seek recreation in physical exercise.

The same remarks apply to life on the farm. The incessant drudgery of monotonous toil day after day from early dawn till late at night has sent farmers and their wives to untimely graves, sometimes to the insane asylum. They need the intellectual stimulus which comes from good books, the health-giving recreation which comes with the change from the fatiguing toil of the day to the perusal of good literature in the evening. Under the more rational policy of providing a supply of good books along with the creation of a taste for reading, the working people of the next generation will be as well read, as well informed, and as capable of sustained thought as those who think money all day, or spend their strength in vocations which act upon the mind very much as a grindstone acts upon a knife,—narrowing the blade while sharpening the edge. Let it be hoped that early in the twentieth century the laboring classes will have shorter hours of work, more leisure for reading, and an appreciation of good books equal to that of Charles Lamb, who asserted that there was more reason for saying grace before a new book than before a dinner. Under the beneficent influence of free text-books and free libraries it should be possible to create in the rising generation a spirit like that of Macaulay, who declared that if any one should offer to make him the

The farm.

Twentieth century.

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greatest king that ever lived, with palaces and gardens, and fine dinners and wines, and coaches and beautiful clothes, and hundreds of servants, on condition that he should not read books, he would decline the offer, preferring to be a poor man in a garret with plenty of books rather than a king who did not love reading.

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X

OBSERVATION AND THINKING

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The degree of vision that dwells in a man is the correct measure of a man.

THOMAS CARLYLE.

When general observations are drawn from so many particulars as to become certain and indubitable, these are the jewels of knowledge.

DR. I. WATTS.

To behold is not necessarily to observe, and the power of comparing and combining is only to be obtained by education. It is much to be regretted that habits of exact observation are not cultivated in our schools; to this deficiency may be traced much of the fallacious reasoning, the false philosophy which prevails.

HUMBOLDT.

You should not only have attention to everything, but quickness of attention, so as to observe at once all the people in the room, their motions, their looks, and their words, yet without staring at them or seeming to be an observer. This quick and unobserved observation is of infinite advantage in life, and is to be acquired with care; and, on the contrary, what is called absence, which is a thoughtlessness and want of attention about what is doing, makes a man so like either a fool or a madman, that, for my part, I see no real difference. A fool never has thought, a madman has lost it, and an absent man is for the time without it.

LORD CHESTERFIELD.

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X

OBSERVATION AND THINKING

VERY few thinkers have let us into the secret of their thinking. Probably most of them could not if they would. They are too much absorbed in that which engrosses their attention to pay any heed to the processes of the inner life. Occasionally an inventor or discoverer gives us a glimpse of the state of his mind when the new idea flashed into consciousness. Such glimpse always reveals his indebtedness to habits of careful observation. His thinking was stimulated by some felt want or puzzling phenomenon, and perhaps by contact with others engaged in similar lines of study. Oftentimes a number of persons are thinking of ways, means, and contrivances by which a widely felt want may be supplied or a perplexing fact explained. After prolonged effort and meditation, during which the mind is concentrated upon one thing to the neglect of everything else having no bearing upon the problem in hand, the happy thought is suggested by the observation of some neglected fact or the perception of some unsuspected relation. Probably half the inventions are made in that way. What seems accidental or a piece of good luck is in reality the result of long musing and reflection, during which many comparisons are made, until at length the right combination gives the desired result. Wants keenly felt by mankind in general or by some gifted in-

Inventors.

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dividual in particular serve as a powerful stimulus to thought, and quicken the eye and the ear to perceive what was before unnoticed, thereby laying the foundation for invention, discovery, or progress in new fields of thought.

Great writers are equally indebted to their powers of observation. Of the men of genius whom the world delights to honor, probably no one watched his inner development more closely than Goethe. He gives us the following account of how his works were produced:

Writers.

"To each one of my writings a thousand persons, a thousand things have contributed. The learned and the ignorant, the wise and the foolish, childhood and age have all a share therein. They all, without suspecting it, have brought me the gifts of their faculties, their thought and experience. Often they have sown, and I have reaped. My works are a combination of elements which have been taken from all nature and which bear the name—Goethe."

Goethe.

Human nature furnishes as much room for observation as all the rest of nature. The hopes and fears, the joys and sorrows, the trials and struggles, the thoughts and beliefs, the aspirations and achievements, the motives and deeds of the men and women whom we meet in our daily life and on the pages of history and fiction (such as is true to life) offer a field for observation as vast, as interesting, and as important as all the rocks and soils, the bugs and beetles, the insects, birds, beasts, and fishes that dwell beneath or above or on the surface of the earth. The larger proportion of the books taken from free libraries are works of fiction,—a fact which shows that the interest of most of those who read is centred upon the things of the human heart and in the observation of human life.

Human nature.

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Goethe's views of originality are these:

"We are always talking about originality, but what do we mean? As soon as we are born the world begins to work upon us, and this goes on to the end. After all, what can we call our own except our energy, strength, and will? If I could give an account of all that I owe to great predecessors and contemporaries, there would be little left of my own." Originality.

Observation lies at the basis of the thinking which leads to invention in the arts, to discovery in the domain of science, to productivity in the fields of literature, journalism, and oratory. It lies at the foundation of success in the professions and in the ordinary walks of life. The medical school, for instance, seeks to develop the power of noting facts and making careful observations. It encourages the student to put his observations on paper while the patient is before him, to compare the diseased or injured part with the corresponding healthy part, and to watch symptoms as a basis for a correct diagnosis of the case to be treated. Observation.

The use of the encyclopædia, if pursued without any attempt to verify its statements, may destroy the habits of observation which are so essential to correct thinking. Mere reliance on books cannot beget trustworthy habits of thought, for books contain the errors, as well as the wisdom, of the ages. Errors of judgment may be corrected by thinking; errors of fact must be corrected by observation. Many a book is made useless by new observations and discoveries. "Send to the cellar as useless every book on surgery that is eight years old," said the professor to the librarian of a great university. The order is an indication of the rapid advances which science is making under the influence of observation, experiment, hypothesis, and verification. Observation is needed not merely to extend our scientific Books.

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knowledge, but far more imperatively to acquaint us with our environment. We cannot learn from books the multitudinous details of business, or of our daily life. Books cannot make us acquainted with the circle of friends in which we move, the pupils whom we teach, the things in dress, toilet, and behavior upon which our standing and reputation very largely depend. No thinker has a right to neglect these. Many a famous professor has diminished his usefulness by carelessness in the observation of such details. The worst failures in the class-room are due to failure in observing either the difficulties or the conduct of the pupils. If conduct is to be regulated, it must be observed; if difficulties are to be explained, the teacher must perceive when and where they occur.

Daily life.

Men noted for their absent-mindedness nevertheless owe much of their fame and success to their ability to make accurate observations in favorite lines of study. Notwithstanding the many ludicrous tales about Newton's failure to see ordinary conditions and circumstances, he showed himself indefatigable in watching the effect of a glass prism upon the ray of light admitted into a dark room. The falling of an apple started in his mind a train of thought which led to the discovery of the law of gravitation.

Our best thinking is based upon experience, and our two main sources of experience are observation and experiment. How does experiment differ from simple observation? In the latter we watch conditions, phenomena, and sequences as they follow one another in the ordinary course of nature. In an experiment we change or control the course of nature by varying the conditions and causes for the sake of seeing the effects produced. In experiment the relation of causes and effects is studied by adding or excluding

Experiment.

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one factor after another. Take the discovery which made Daguerre famous. Up to his time men had tried in vain to fix the impression of the image formed in the camera obscura. No alchemist ever went to work at a more unpromising task than the one Daguerre set before himself. "As years rolled on, the passion only took deeper hold upon him. In spite of utter failures and discouragement of all kinds, for years in loneliness and secrecy, suspected of mental weakness even by his wife, he kept on in the same line of experiment." Finally an accident gave him a clue to discovery. The plates with which he experimented were stowed away in a rubbish closet. One day he found, to his surprise, upon one of these plates the very image which had fallen upon it in the camera. Something in the closet must have produced the effect. He removed one thing after another, getting the same effect, until nothing remained except some mercury which had been spilled upon the closet floor. This was inferred to be the agent which developed the image, and thus was laid the foundation of the modern art of photography.*

Daguerre.

The observation of a fact often stimulates thought in new directions. In fact, new sciences have arisen from accidental observations. "Erasmus Bartholinus thus first discovered double refraction in Iceland spar; Galvini noticed the twitching of a frog's leg; Oken was struck by the form of a vertebra; Malus accidentally examined light reflected from a distant window with a double refracting substance; and Sir John Herschel's attention was drawn to the peculiar appearance of a solution of quinine sulphate. In earlier times there must have been some one who first noticed the strange behavior of a loadstone, or the unaccountable

Accidental observations.

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*Charles F. Himes's "Actinism," pages 5, 6.

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motions produced by amber. As a general rule we shall not know in what direction to look for a great body of phenomena widely different from those familiar to us. Chance, then, must give us the starting-point; but one accidental observation well used may lead us to make thousands of observations in an intentional and organized manner, and thus a science may be gradually worked from the smallest opening." *

Factories.

In recent years experimental research has become a regular occupation in connection with large manufacturing establishments. In some factories along the Rhine upward of sixty men are employed in chemical experiments for the purpose of finding what use can be made of waste products. In this way over two hundred useful products from petroleum have been discovered, and a large increase in profits has been the result. The great electrical works spend time and money upon experiments, and jealously censor every article written by their employees for scientific journals lest their valuable secrets should be given away. A company engaged in the manufacture of cash registers offers a yearly premium for the most helpful suggestion from the men and women in its employ. In one year the firm received over eleven hundred suggestions, of which at least eight hundred were utilized in improvements of various kinds.

Universities.

These instances are only samples of many that could be cited to show how systematic observation and experiment lend a helping hand to our national prosperity. Manufacturers carry them on for the sake of gain, the universities for the sake of widening the field of knowledge. To aid in such research large endowments have been established, and many of the common people willingly pay tax in support of State universities.

* Jevons's "Principles of Science," pages 399, 400.

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Treatises on inductive logic and on the physical sciences have been prepared by Herschel, J. S. Mill, Jevons, and others for the purpose of showing the correct methods of research by the use of instruments of precision, of standards of measurement, and of other apparatus; for the laws of thought must be obeyed in the interpretation of natural phenomena. Although as a matter of discipline the teacher in our public schools may well study these advanced treatises, yet the habits of observation which the elementary school should aim to beget and to foster are simpler in detail, more easily acquired, and, it may be added, of inestimable value in the subsequent life of the pupils. Habits of observation are needed not only by authors, inventors, and scientists, but also by all other people for the interpretation of the books they may read and for the discharge of the daily duties devolving upon them. The engineer, the fireman, the conductor, the tradesman, the mechanic, the detective, the scout, the warrior, must be able to see things as they are or face partial failure. Too many of them have eyes and see not; they have ears and hear not. The study of nature is valuable as a preparation for life either in the country or in the city. Our rural population have not learned to see and appreciate the marvels in nature which are transpiring on every side. The way in which the almanac is consulted for signs to guide in sowing and planting, for prognostications of the weather, show how little the average man can make observations. The printers have found it necessary to retain these absolutely unreliable weather predictions in their almanacs; the attempted omission has been an experiment involving the loss of thousands of dollars. The success of the quack is largely due to limited observation. One cure is made much of while multitudes of failures are always forgotten.

Where observation is needed.

The weather.

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Our rural population would be far more contented if the boys and girls were taught at school how to observe and appreciate their surroundings. They have many advantages over city folks which they never realize as sources of enjoyment. The senses themselves, which have been styled the gate-ways of knowledge, may be improved by judicious exercise; and the power of the mind to interpret sense-impressions may be developed to a marvellous degree. The savages of our North American forests had developed keen eyes and ears; the more civilized backwoodsmen were soon more than a match for the wily Indian. To-day, when the latter watches the trained sharp-shooters hitting with unerring accuracy a mark more than half a mile distant, he shakes his head and walks away in silence.

Country and city.

It has been asserted that a child gains more knowledge in the first seven years of its life than in all its subsequent days. If the domain of abstract and scientific knowledge be excluded from the comparison, this is probably true. At any rate, if the thinking which is based upon the knowledge of facts thus gained is to be correct, the facts must be correctly observed.

The child.

Observation is thus of prime importance, not merely as furnishing a stimulus to thought, but also as supplying abundant materials of thought. Travel, experience, experiment, as well as the ordinary course of natural phenomena, furnish abundant opportunity for the formation of correct habits of observation. The observations thus made should be recorded in the memory, if not on manuscript. From the storehouse of the memory, thus filled with materials for thought, the mind derives many of the best data for reaching conclusions. Observation, experience, and reading, as sources of thought-material, presuppose

Observation a source of thought-material.

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an accurate and retentive memory in those who think well and act well. The relation of memory to thinking deserves treatment in a separate chapter.

There is a limit to the number of observations which the mind can carry and use. Nature-study may be overdone. Mere seeing is not thinking. What the eye beholds must be sorted and assigned to its appropriate class; otherwise the treasure-house of memory will soon resemble a wilderness of meaningless facts. Than this only one thing can be worse,—namely, a wilderness of meaningless words.

Nature-study.

Reading is a species of observation. An exercise in oral reading, during which each pupil is called down as soon as he miscalls a word, is often an astonishing revelation, showing how few of the advanced pupils can accurately see and correctly name every word in a stanza or paragraph. Methods of teaching a beginner to read are correct in seeking to develop the ability to pronounce words without help from others. Faulty application of a method that is right in this respect may seriously retard, and even destroy, the power of thinking what is on the printed page. What on earth is a first-year pupil to do with the many hundred words which he is sometimes taught to pronounce? Often words are arranged in sentences which come dangerously near the slang of the slums, and which no child ever hears in a cultured home. Furthermore, some sentences in primers and first readers are well-nigh void of meaning, the aim being to teach the words for the sake of the combinations of letters which they contain. The first test to apply to a method of teaching a beginner to read is the question, How quickly does it teach that which must be known as a condition of pronouncing new words,—namely, the shape and the

Reading and observation.

Teaching a child to read.

First test.

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sound or sounds of each of the letters of the alphabet? As compared with the sound and the shape, the name of the letter is of relatively little importance. Students of Hebrew may read that language fluently without being able to repeat the Hebrew alphabet, the names of the letters being a mere matter of convenience in talking about them. The second great test to be applied to the method of teaching a beginner to read is the question, Does it form the habit of getting thought from the printed page? Grown men have admitted that they passed through several readers before they discovered that there was a meaning or connected story in the words which they were pronouncing. They saw and gave names to words very much as people see and give names to objects round about them without recognizing the significance of what is seen, or thinking the thoughts which the Author of the Universe has spread out before them in the great book of nature.

Second test.

The third test to be applied to the method of teaching reading is the question, Does it save the pupil from the unnatural tones of the school-room by training him to use his voice in the right way? To this test reference will be made later.

Third test.

If observation is to have abiding value, it must lead to thinking. This is as true of the observation of words and sentences on the printed or written page as it is of the observation of earth and sky and sea, of the starry heavens above and the moral law within (which filled the soul of the philosopher Kant with never-ceasing awe). How the things obtained from books and from the world outside are appropriated in thought and made our own will appear more fully when we discuss the relation of memory to thinking.

Observation should lead to thinking.

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XI

THE MEMORY AND THINKING

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Overburden not thy memory to make so faithful a servant a slave. Remember Atlas was weary. Have as much reason as a camel, to rise when thou hast thy full load. Memory, like a purse, if it be overfull that it cannot shut, all will drop out of it: take heed of a gluttonous curiosity to feed on many things, lest the greediness of the appetite of thy memory spoil the digestion thereof.

THOMAS FULLER.

To impose on a child to get by heart a long scroll of phrases without any ideas is a practice fitter for a jackdaw than for anything that wears the shape of man.

DR. I. WATTS.

The habit of laying up in the memory what has not been digested by the understanding is at once the cause and the effect of mental weakness.

SIR W. HAMILTON.

There is no one department of educational work in which the difference between skilled and unskilled teaching is so manifest as in the view which is taken of the faculty of memory, the mode of training it, and the uses to which different teachers seek to put it.

FITCH.

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XI

THE MEMORY AND THINKING

MANY people freely admit that they have a poor memory. Their misstatements, breaches of etiquette, and failure to keep engagements they excuse by claiming a poor memory for dates, names, faces, facts, and the like. Accuse them of possessing poor judgment, and they are very much offended. They fail to see the close relation between a good memory and good judgment, between an accurate memory and sound common sense, which is but another name for good judgment in matters that all men have in common. Judgment affirms the agreement or disagreement between two objects of thought. It involves comparison. How can the comparison be accurate if the memory is not accurate in the ideas it recalls of the things to be compared?

Memory and judgment.

At one time it was a mooted question whether the mind can think of more than one thing at a time. As a matter of doubt this question is no longer discussed. For, since all thinking involves comparison, if two objects are to be compared, they must be held before the mind at one and the same time. A good memory is, therefore, a very important aid to reflection.

Comparison.

And yet Thucydides and Lord Bolingbroke are said to have complained of a memory so retentive of details that it seriously interfered with their processes of thought. It

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is commonly believed that much memory work interferes with the growth and development of a pupil's ability to think. "Much memorizing deadens the power of thought," says W. T. Harris, who is recognized at home and abroad as one of the profoundest thinkers that America has produced. Innumerable anecdotes are told of great thinkers to show their forgetfulness in the commonest details of every-day life. These anecdotes are handed down from one generation of students to the next; their mirth-provoking character gives them vitality; they grow more ludicrous the oftener they are told; they do harm because they lead pupils to undervalue the importance of a good memory to those who are ambitious to shine as thinkers. Often, after it is too late, the student finds how he has crippled his whole intellectual life by neglect and abuse of the memory. A correct conception of the nature of memory and its function in every department of thought and research is of immense importance to those who teach, as well as to those who have gone far enough in their studies to give conscious direction to their own intellectual life. Most writers on education have treated, directly or indirectly, of the use and abuse of the memory; every examiner appeals to it more or less in the questions he puts; and every teacher shows the nature and extent of his skill in the kind of demands he makes upon the retentive power of his pupils. Take, for instance, the lesson in geometry. There are two ways of learning and giving the proof of a theorem: the language of the text-book may be committed to memory, and accepted in the class-room; or the pupil may fix in his mind the line of argument and give in his own language the successive steps of the demonstration. The former method is a sure sign of bad teaching and of defective habits of study. When-

Memorizing.

Two forms of memory.

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ever a skilful teacher finds his pupils giving the exact words of the text-book on geometry, he changes the lettering of the figure, and sometimes even the figure itself. He is not satisfied until he feels sure that the pupil is thinking the thoughts of the geometry and recalling the ideas by the inner nexus which binds them into a line of argument. He insists on it that the learner shall cultivate a memory for ideas rather than words.

Does it follow that the verbal memory is to be neglected and despised? This is the feeling of the learner who has tasted the joys of thinking; he hates the drudgery of learning by heart, because he has reached the age when logical memory begins to assert itself at the expense of the verbal memory. No less a psychologist than Professor James of Harvard has recently put in a plea for the verbal memory which, by reason of the abuses to which it was formerly subjected, has fallen into such disuse that pupils on reaching the high school are often unable to quote a single stanza of poetry. In his "Talks on Psychology to Teachers" he says,— Verbal memory.

"The older pedagogic method of learning things by rote, and reciting them parrot-like in the school-room, rested on the truth that a thing merely read or heard, and never verbally reproduced, contracts the weakest possible adhesion to the mind. Verbal recitation or reproduction is thus a highly important kind of reactive behavior on our impressions; and it is to be feared, in the reaction against the old parrot recitations as the beginning and end of instruction, the extreme value of verbal recitation as an element of complete training may nowadays be too much forgotten."*

Psychologists have shown that, in remembering and

* "Talks on Psychology," page 34.

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recollecting, the mind works according to certain laws of association. Of two words or ideas which have been before the mind at the same time, or in immediate sequence, the one naturally tends to suggest the other. If the attention is directed to the words as they follow each other in a line of poetry, the memory will recall these in the order in which they occur. If the mind's eye is fixed on the ideas which the words express, the memory may carry these by reason of the logical connection which exists between them. Often the connection between the two things which are to be remembered is purely arbitrary. Then the link which binds them together must be forged by some mechanical process like frequent oral repetition, or by constant gazing at them upon the printed page, or by writing them out so that the impression made upon the mind through the eye and the ear is further strengthened through the muscular sense. The latter species of memory is usually called the mechanical memory, in distinction from the memory for ideas, which has been aptly styled the logical memory.

Association.

The verbal memory is but one form of the mechanical memory. There is no necessary connection between persons and their names, between events and dates, between things and their symbols; these must be learned by bringing them together before the mind until by the law of association, called contiguity in time and place, the link that binds them is forged; or, to change the figure, until they occupy places side by side on the tablets of the mechanical memory. It is sometimes supposed that there is a necessary connection between the two factors and their result in the multiplication table. But the moment we construct an arithmetical scale based on the dozen instead of ten, $7 \times 8 = 48$ instead of 56 (the former combination of figures signifying four twelves and eight ones), and the arbitrary character

Mechanical memory.

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of the combinations in the Arabic notation becomes apparent at a glance. Sometimes a peculiarity in a rule like that for the middle and the opposite parts in the right-angled spherical triangle may assist the memory; but in most cases the formulas which are in constant use in the higher mathematics must be fixed by the methods of drill appropriate for the mechanical memory.

It is a mistake in teaching as well as in practical life to neglect the mechanical memory. In many directions it takes care of itself through the conditions and requirements of a person's daily occupation. The salesman in a large store, the conductor on a railway, the politician on the hustings remembers many things in this way, and not because they are bound together by a logical nexus like that which binds together the thoughts of a geometrical proof. Many things which the pupil must carry from the school into practical life must be retained through drill and repetition. Pestalozzi imagined that if he taught pupils how to construct the multiplication table it would not be necessary for them to commit it to memory. The Swiss teachers long ago found out the insufficiency of his method; found out that, whilst it pays to let a pupil construct the table for himself, because it increases his interest in the combinations, and thus lightens the burden of the mechanical memory, the drill must be kept up until the sight of two factors suggests their product with infallible accuracy. Valuable time can be saved if the teacher will make a list of things that must be fixed in the mechanical memory for the purpose of facilitating the thought-processes in more advanced stages of instruction and in the discharge of the duties of practical life. The following are typical examples of what should be lodged in the mechanical memory:

Pestalozzi's mistake.

1. A reasonable vocabulary of words in the mother tongue.

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2. A working vocabulary of words in the foreign languages which the circumstances or occupation of a student will compel him to use.

3. The combinations of addition up to one hundred, the multiplication table, and the tables of weights and measures.

4. Algebraic and other formulas which constantly recur in the higher mathematics.

5. The fundamental formulas in chemistry, physics, and other sciences.

6. Declensions, conjugations, comparison, and genders of words in such foreign languages as the pupil expects to read, write, and speak.

7. The most necessary fact-lore of history and geography.

8. Choice selections from the best literature and such definitions as mark a triumph of intellect in the history of human thought.

This enumeration may indicate the range and kind of knowledge which should be fixed in the mechanical memory so that the mind may be in possession of the best instruments of thought evolved by ages of civilization. Many of the things above named must be learned by an effort of retention, pure and simple, like that of the boy who is sent to a store to buy half a dozen sheets of paper, two yards of ribbon, five dozen eggs, and specified quantities of salt, flour, and other provisions. He may write these on paper and thus ease the memory burden, but in solving mathematical problems and in reading, writing, or speaking a foreign language it is impossible always to carry for use written or printed tables, vocabularies, and lexicons. To use these in thinking, one must have them on his tongue and at his fingers' end. Of course it makes a difference whether one wishes simply to read a language, like Latin or Greek, or to use it, like French and German, in conversation and corre-

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spondence. In the former instance it is sufficient to learn the language symbols through the eye; in the latter they must be acquired through the ear, the tongue, and the pen.

Time for learning languages.

It is a wise provision of nature that the perceptive powers and the mechanical memory are most active in childhood and youth. The normal child is hungry for words and facts, and gathers information from every conceivable quarter. The judgment and the reason develop after the mind has been stored with the materials upon which these may act. Parents and teachers who are ignorant of this order of development often force the reasons for arithmetical processes upon the pupil when these are difficult and when he could learn the eleven hundred variations of the Greek verb without difficulty, whilst the study of the classical and foreign languages is postponed to an age when the acquisition of a new language becomes a difficult task because the logical memory has driven the mechanical into the background, and the growth of judgment and reason makes the pupil crave the intellectual food furnished by the thought-studies. It is a species of cruelty to force upon children the consideration of the why's and the wherefore's of mathematical operations, when learning how to go through the motions would be quite enough of a tax upon their mental strength. Some of the demonstrations in arithmetic are logically more difficult than many of the proofs in geometry; hence no pupil should be asked to pass his final examination in arithmetic before he has mastered the elements of geometry. The proper sequence of subjects is of immense importance in leading the child from the lower to the higher forms of intellectual activity. With the proper study of geometry the logical memory steps to the front, and the thought-studies should then supplant those which largely appeal to the mechanical memory.

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Nevertheless, it is a distinct loss if the verbal or mechanical memory is ever allowed to drop into desuetude. On this point the practice, as well as the testimony, of Dr. W. T. Harris is worthy of the attention of every person charged with the training of himself or others.

"If a person finds himself forgetful of names, it is a health-giving process to take a certain portion of time in committing to memory words. If this is done by committing new masterpieces of poetry and prose, or in committing to memory the words of a new language, there is profit or gain to the thinking powers, as well as to the memory. Doubtless the cultivation of verbal memory, building up, as it does, a certain convolution in the brain, has a tendency to prevent atrophy in that organ. This contains a hint in the direction of keeping up in the later part of life the faculties which are usually so active in youth. The tendency is to neglect childish faculties and allow them to become torpid. But if this is liable to weaken certain portions of the brain in such a way as to induce hemorrhage, ending in softening of the brain, certainly the memory should be cultivated, if only for the health of the brain, and the memory for mechanical items of detail should be cultivated on grounds of health as well as on grounds of culture. The extreme advocates of the rational method of teaching are perhaps wrong in repudiating entirely all mechanical memory of dates and names or items. Certainly they are right in opposing the extremes of the old pedagogy, which obliged the pupils to memorize, page after page, the contents of a grammar *verbatim et literatim et punctuatim* (as, for instance, the graduates of the Boston Latin School tell us was the custom early in this century). But is there not a middle ground? Is there not a minimum list of details, of dates and names which must and should be memorized,

Harris on the memory.

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both on account of the health of the nervous system and on account of the intrinsic usefulness of the data themselves? And must not the person in later life continue to exercise these classes of memory which deal with details for the sake of physical health? This is a question for the educational pathologist." *

A teacher of Hebrew spent one-fourth of his time in drill on Hebrew roots and their meaning. His students groaned under the drudgery imposed. At the end of the first six chapters of Genesis, he surprised his class by the announcement, "Now you know half the words in the Hebrew Bible." He had selected words used five hundred times, then words used three hundred times, and drilled on these in various ways until he had fixed all the words in most frequent use in the Hebrew text. It was a great saving of time in the end, and a great step towards reading at sight the Old Testament in the original. By the modern short-cuts to knowledge the pupils are hurried from one classic author to another, and hence they never master the vocabulary to the extent of reading Latin or Greek at sight. A little less haste at the start, and a little more drill for the purpose of fixing new words as they come up, thus avoiding the everlasting turning to the lexicon for more than half the words in a lesson, would facilitate progress and enable the student to find some pleasure in the study of foreign languages.

Vocabularies.

An old teacher of Latin, who had discovered this secret in the acquisition of a foreign tongue, agreed to take a small class in Livy on condition that the students write in a special blank-book and review every day all the words whose meaning they were required to hunt in the lexicon. At the end

Teaching languages.

* "Psychologic Foundations of Education," pages 177, 178.

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of ten weeks half the class read two pages without looking up more than two words. Their study of Latin not only gave them a sense of pleasure, but, in thinking the thoughts of the author through the medium of the eye-symbols and then putting them into good English, they acquired excellent thought-material, an extensive vocabulary, and superior skill in syntactical construction. It proved a most valuable exercise in thinking and in the expression of thought.

Valuable as the mechanical memory is for the purpose of furnishing the thought-instruments, it sinks into comparative insignificance alongside of the logical memory. The latter is the memory for ideas, binding them by associations based on cause and effect, reason and consequence, similarity and contrast, the general and the particular. It is the kind of memory by which the mind carries a knowledge of the laws of science, the principles of art, the salient points of a discourse, the train of ideas in a book, the leading thoughts in a system of philosophy. It converts history and geography from a dry collection of facts, dates, and names into a living organism whose parts are internally related by a plastic principle, and combined into a whole that has order and system in every detail. How much better that a pupil's knowledge of history and geography should be thus systematized than that it should resemble a wilderness of facts! As a means for furnishing thought-material, the logical memory is far more valuable than the memory which holds words and things by the accidental ties of sound, sight, and fanciful relations.

Logical memory.

A classification of the forms of memory into portative, analytical, and assimilative, given in Latham's book on the "Action of Examinations," is helpful in determining the relation of memory to thinking.

Latham's classification.

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The portative memory simply conveys matter. "Its only aim, like that of a carrier, is to deliver the parcel as it was received." It is the form of memory that enables some people to carry the contents of entire volumes in their minds, sometimes in the very words, oftener in ideas only. The rhapsodists in ancient Greece who could repeat entire books of Homer are examples in point. Some men of superior talent have possessed this power in an eminent degree. Macaulay, on a voyage across the Irish Channel, rehearsed from memory an entire book of Virgil's "Æneid." It is the kind of memory that shines at examinations and excites the envy of persons less gifted with powers of retention. It may easily be degraded into a slave, doing work which should be performed by higher mental powers. Hence it has been appropriately styled the Cinderella faculty of the mind. Like the girl in the story, it may be abused dreadfully by having all sorts of useless drudgery heaped upon it. To require a child to learn the five thousand isolated facts formerly scattered through treatises on geography was an exercise as useless as the picking of the lentils which were poured into the ashes to give Cinderella something to do, and, unfortunately, there is no bird from fairy-land to assist in the accomplishment of the task.

Portative memory.

Much as we may admire the power of Thomas Fuller, who could repeat five hundred unrelated words in foreign languages after hearing them twice, it is an accomplishment not worth acquiring. As an accomplishment it recalls the king to whom a man exhibited his skill in throwing a pea so that it would stick on the end of a pin,—a feat acquired after years of patient practice. The man hoped to get a valuable present for his exhibition of skill. The king ordered a bag of pease to be given him, saying that it was all his accomplishment was worth.

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There is no end of warnings as to the possible evil effects of a good memory upon the power to think,—warnings that a teacher may take to heart with advantage to himself and others.

Memory and the understanding.

Dr. Carpenter asserts that when the form of memory by which children learn a piece of poetry whose meaning they do not comprehend exists in unusual strength, it seems to impede rather than aid the formation of the nexus of associations which makes acquired knowledge a part of the mind itself. In illustration, he cites the suggestive case of Dr. Leyden, "who was distinguished for his extraordinary gift of learning languages, and who could repeat long acts of Parliament, or any similar document, after having once read it. Being congratulated by a friend on his remarkable gift, he replied that, instead of being an advantage to him, it was often a source of great inconvenience, because, when he wished to recollect anything in a document he had read, he could only do it by repeating the whole from the commencement till he reached the point he wished to recall."

Latham has well said, "The ready mechanical memory of a youth, besides enabling him to mislead unpractised examiners, makes him deceive himself. Teachers find that a very ready memory is a bad educator; it stunts the growth of other mental powers by doing their work for them. A youth who can recollect without trouble will, as it were, mask the difficulty in his classical author or his mathematics by learning by rote what stands in his translation or text-book, and march forward without more ado. Thus a quick memory involves a temptation which may enervate its possessor by suffering him to evade a difficulty instead of bracing himself to encounter it in front." *

* Latham, "Action of Examinations," pages 229, 230.

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Maudsley writes in the same strain: "This kind of memory, in which the person seems to read a photographic copy of former impressions with his mind's eye, is not, indeed, commonly associated with high intellectual power; for what reason I know not, unless it be that the mind, to which it belongs, is prevented, by the very excellence of its power of apprehending and recalling separate facts, from rising to that discernment of their relations which is involved in reasoning and judgment, and so stays in a function which should be the foundation of further development, or that, being by some natural defect prevented from rising to the higher sphere of a comprehension of relations, it applies all its energies to a comprehension of details. Certainly one runs the risk, by overloading the memory of a child with details, of arresting the development of the mental powers of the child; stereotyping details on the brain, we prevent that further development of it which consists in rising from concrete conceptions to the conception of relations." *

Here is another warning from the pen of Archbishop Whately:

"Some people have been intellectually damaged by having what is called a good memory. An unskilful teacher is content to put before children all they ought to learn, and to take care that they remember it; and so, though the memory is retentive, the mind is left in a passive state, and men wonder that he who was so quick at learning and remembering should not be an able man, which is as reasonable as to wonder that a cistern if filled should not be a perpetual fountain. Many men are saved by their deficiency of memory from being spoiled by an education; for those who have no extraor-

* Maudsley's "Physiology of the Mind," page 518.

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dinary memory are driven to supply its place by thinking. If they do not remember a mathematical demonstration, they are driven to devise one. If they do not remember what Aristotle or Bacon said, they are driven to consider what they are likely to have said or ought to have said." *

In his letter to a student who lamented his defective memory, P. C. Hamerton says that, so far from writing, as might be expected, a letter of condolence on a miserable memory, he felt disposed to write a letter of congratulation. "It is possible that you may be blessed with a selecting memory which is not only useful for what it retains, but also for what it rejects. In the immense mass of facts which come before you in literature and in life it is well that you should suffer as little bewilderment as possible. The nature of your memory saves you from this by unconsciously selecting what has interested you and letting the rest go by." †

Analytical memory.

In the last quotation we get a hint of the form of memory which Latham styles the analytical. "The analytical memory is exercised when the mind furnishes a view of its own and thereby holds together a set of impressions selected out of a mass. Thus a barrister strings together the material facts of his case, and a lecturer those of his science by their bearing on what he wants to establish."

Many thinkers sift everything they read, hear, and see. That which they do not need is rejected and forgotten. That which has a bearing upon their investigations is selected, retained, and utilized. As an aid in thinking a form of retention called the index memory is very helpful. The lawyer should know where to find such law as

* Annotations on Bacon's Essay "Of Studies."

† Hamerton's "Intellectual Life," page 125.

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he does not carry in his head. Having found the required statute or judicial interpretation, he applies it to the case in hand. No sooner is a case finally decided or settled than he drops its details from his mind and directs his intellectual strength to the interests of the next client.

In this ability to sift, select, and reject, as the occasion demands, lies the secret of the success of many a public lecturer, of many a magazine writer. The men in the pulpit or upon the platform who lack this gift soon wear out; the public speedily detects when they have nothing more to give. The preparation of debates, speeches, essays, and theses trains these forms of memory. After the analytical habit has been formed, the student unconsciously, yet constantly, gathers, classifies, and stores materials for thought. The public are frequently surprised by the array of striking facts, interesting data, apt illustrations, and pleasing anecdotes with which he enlivens every topic of discussion and elucidates every subject of investigation.

Higher than the analytical is the assimilative form of memory which "absorbs matter into the system so that the knowledge assimilated becomes a part of the person's own self, like that of his name or of a familiar language." The assimilation of knowledge has a parallel in the assimilation of food. The phrase that knowledge is the food of the mind has almost become classical in treatises on education. The figure of speech throws light upon the relative functions of memory and thinking in the acquisition and elaboration of knowledge. Before the food is set before the child it should be cooked and put into the most palatable form,—a parallel to the preparation of the lesson by the teacher so that he may put it before the learner in its most attractive form.

Assimilative memory.

Before the food is swallowed it should be masticated,

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broken into parts,—a parallel to the act of analysis by which the chunks of knowledge are resolved into their elements and each set before the mind in the simplest form, in the form in which it can be grasped most easily.

If the food remains in the stomach unchanged, it produces dyspepsia and a long train of bodily ills. If the knowledge which the mind appropriates is retained unchanged, it produces mental dyspepsia, and there is no real assimilation. From this point of view we can easily see why Montaigne said that to know by heart is not to know at all. Just as the food which is taken into the body must be transformed into chyme and chyle and blood before it can be assimilated, so the knowledge which is taken up by the mind must be transformed if it is to be assimilated. The best illustration of the transformation of knowledge is that given by an anecdote of Gough, which has now become classic. In a Pullman car a crying child was disturbing the slumbers of every passenger. At last a gruff miner, whose patience was exhausted, stuck his head out of his berth and exclaimed, "I should like to know where that child's mother is?" "In the baggage car in a coffin," was the reply of the person in charge of the child. The knowledge imparted by that phrase was immediately transformed into new thought and sentiment and purpose. There was not another word of complaint throughout the entire journey; every passenger was thinking of the unfortunate child in the light of an orphan. Their hearts were stirred with feelings of sympathy, which, in the case of the old miner, issued into will and purpose, for he got up, began to carry the little one, and did his best to make it feel contented in the new surroundings. If the lessons in civil government and history of the United States remain in the memory a mere tissue of dates, names, and events, the teacher has

Transformation of knowledge.

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failed, no matter how brilliant the answers in class or at the examination. If these lessons do not issue in new thoughts, sentiments, and purposes, if they do not enlarge the mental vision of the pupils, beget in them the sentiment of patriotism and cause them to resolve that they will support the government by paying a just share of its taxes and by insisting on a pure ballot,—in a word, if these lessons do not make the pupil say that he will live for his country and even die in its defence,—then the teacher has failed because there has been no adequate assimilation of knowledge.

Another figure of speech is sometimes used to describe the transformation of knowledge. "Except a grain of wheat fall into the earth and die, it abideth by itself alone; but if it die, it beareth much fruit." * If the knowledge which enters the mind remains unchanged, it abideth by itself alone. But if it perish in its original form, if it is changed through the process of growth so as to enter into new relations, it brings forth a harvest of thought and sentiment and purpose. The last two should be the concomitants of the crop of new thoughts which spring from seed-thoughts implanted in the soul.

That the ancients understood the use and abuse of the memory is evident from their method of teaching law.

The Roman school-boy learned by heart the Twelve Tables of the Law. His teachers were not satisfied with a mere knowledge of the words; they insisted that he should understand the meaning of the law, and apply it in regulating his own conduct and in passing judgment upon the conduct of others. Is it any wonder that the Roman people became the exponents of law and order throughout the civilized world, and that Roman jurisprudence still exerts a moulding

Teaching the law.

* John xii. 24, Revised Version.

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influence upon the legislation of the Latin races, if not of the entire civilized world?

There is still another nation of antiquity whose youth were instructed in the law with the most scrupulous care. The Ten Commandments of the Mosaic Law were committed to memory. In Chapter VI., 6–9, of Deuteronomy, we read: "And these words, which I command thee this day, shall be in thine heart: and thou shalt teach them diligently unto thy children, and shalt talk of them when thou sittest in thine house, and when thou walkest by the way, and when thou liest down, and when thou risest up. And thou shalt bind them for a sign upon thine hand, and they shall be as frontlets between thine eyes." Verse 18 of Chapter XI. is still more explicit: "Therefore shall ye lay up these my words in your heart and in your soul, and bind them for a sign upon your hand, that they may be as frontlets between your eyes."

The exact words of the law were to be fixed in the memory, and kept both before the bodily and mental eye until they passed into the deeds and conduct of every-day life. In John vii. 49 we find the same thought: "This people who knoweth not the law are cursed." This was the universal conviction of the Jewish people after the Babylonian exile, if not before. The reading of the Talmud has been likened unto travelling through endless galleries of lumber, where the air is darkened and the lungs are well-nigh asphyxiated with the rising dust. On one point, however, the Jewish Rabbis speak with the authority and earnestness of those who know whereof they affirm. "To the Law!" is the exhortation sounded abroad in every key. "Let your house," says one, "be a house of assembly for those wise in the law; let yourself be dusted by the dust of their feet, and drink eagerly their teaching." "Make the study of the law thy special business," says another. "The more teaching of the

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law," says a third, "the more life; the more school, the more wisdom; the more counsel, the more reasonable action. He who gains a knowledge of the law gains life in the world to come."

Maxims like the following show the stress that was laid upon exercises designed to bring out the full force and import of the law: "When two sit together and do not converse about the law, they are an assembly of scorners, of which it is said, 'Sit not in the seat of the scorners.' When, however, two sit together and converse about the law, the Shechinah (the Divine Presence) is present among them." "When three eat together at one table, and do not converse about the law, it is as though they ate of the offerings of the dead. But when three eat together at one table and converse about the law, it is as though they ate at the table of God." "The following are things whose interest is enjoyed in this world, while the capital remains for the world to come; Reverence for fathers and mothers, benevolence, peace-making among neighbors, and the study of the law above them all."

It is very apparent that the chosen people were not satisfied with mere memorizing of the law. Their teachers sought to make it a living, regulative force in all the relations of man. Their practice emphasized a phase of memory work which should be borne in mind whenever pupils are requested to learn by heart any form of words or selection of literature. Words have no value so long as they remain mere words. When words convey the intended meaning, the more perfect the form in which they are joined together the deeper and more lasting is the impression made upon the mind of the learner. The thoughts which have been transmitted in forms fixed for ages may not produce a harvest of new thought and linguistic expression, but may issue in feeling and will,

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in lofty emotions and noble purposes, in heroic deeds and unselfish devotion, in righteousness and right conduct far more valuable than mediocre effusions of prose and poetry, or many of the speculations of scientists and philosophers.

Seed-thoughts.

Thoughts that are to regulate conduct and life may be remembered in the form in which a nation has treasured them for ages. If thoughts are to become seed-thoughts, their form must be changed through the process of growth; otherwise no crop of new thoughts can mature. The expression, seed-thoughts, is a figure of speech based upon vegetable life. The mind may be likened unto soil that has become fertile through the labor and skill of the husbandman. The mind grows fertile and productive by cultivation. Like the sower going forth to sow, the good teacher deposits in the youthful mind ideas which germinate and bring forth a harvest of thought, sentiment, and purpose. If the grain of wheat be cut in pieces, and then put into the soil, there can be no growth, because the life has been destroyed. The ideas which the teacher instils into the minds of the pupils should be living ideas. Their vitality should not be destroyed by dissection into fragments from which all life has departed. Sunshine and moisture are conditions of growth. Lack of sympathy is lack of sunshine. Cold natures have an Arctic effect in stunting and preventing growth. Again, instruction may be so dry that nothing can thrive under its influence. Like a drought, it may speedily evaporate the child's love of school and interest in study. Weeds may choke the growing crop. These the husbandman removes and destroys, so that the good seed may have a chance to ripen. With equal solicitude the faithful teacher watches the development of the seed-thoughts which are sprouting in the mind. For a time the seed is hid in the earth. Seed-

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thoughts disappear in the unconscious depths of the soul. They are not lost. By processes which we cannot explain, they sprout and grow and ripen. That such mysterious processes are going forward in the hidden depths of the soul cannot be doubted. A process of growth may be unseen; its visible results are evidence that it exists and is going forward. If the soil be barren or the conditions of growth be wanting, no harvest is possible. Unfortunately, the unskilful husbandman always blames the soil and the weather when he himself is at fault. Unfortunate is the pupil whose teacher is a fossil, devoid of life and the power to infuse life. Under such a teacher the pupil always gets the blame.

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XII

IMAGING AND THINKING

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Things more excellent than any image are expressed through images.

JAMBLICHUS.

An unimaginative person can neither be reverent nor kind.

RUSKIN.

Few men have imagination enough for the truth of reality.

GOETHE.

Science does not know its debt to the imagination.

EMERSON.

The human race is governed by its imagination.

NAPOLEON.

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XII

IMAGING AND THINKING

EVERY human being divides the world into two parts, the self and the not-self. It would not be right to say that he divides the world into two hemispheres, because self may occupy more space and engross more thought than all else in the universe.

The idea of self is complex. It includes our thoughts, emotions, and purposes. Kindred and friends, home and country, creed and occupation, dress and personal appearance, possessions and the work one has done,—in fact, all one has and is and does enters into the idea of self. When we lose a child, a manuscript, an investment, a position, we are apt to feel as if a part of ourselves had been lost. So closely are the things of self identified with the inner self, the self in the narrowest signification of the term, that the latter is oftentimes lost in the former; and the end of existence is sought in wealth, fame, honor, social position, erudition, and the thousand other things which intensify the feeling of self by giving it form and content.

Self.

An important element in the thought of self is the image of self that every man carries in his own mind. This image of self is derived from looking-glasses and photographs, from the sight of hands and feet and the other impressions of the physical organism which reach the mind through the senses. In the minds of many persons the image of self is ever present, it matters not whether they are eating or drinking, walking or talking, singing or thinking, posing or work-

Image of self.

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ing. The perpetual presence of the image of self gives rise to vanity and pride, to avarice, ambition, and other detestable forms of selfishness.

It is the province of education to bring self and the things of self into proper relation with the not-self, with God and the universe. That this may be accomplished the images of sense and the idea of self must be made to take their proper place in the domain of thought and volition.

Education defined.

Not many years ago it was customary in certain quarters to define education as the process of unsensing the mind and unselfing the will. The definition never became popular. It contains a truth and an error, both deserving of careful consideration. The maxim may signify that by the process of education the soul is to be emancipated from the tyranny of the senses and from the domination of selfish desires. The mind may be hindered in its growth because it is under the thraldom of desire and appetite. Excess in eating and drinking, in sight-seeing, and in other pleasures which so easily ripen into dissipation may check the normal development of the higher faculties. The delight which some gifted natures find in beautiful colors and good music may prevent them from acquiring the power of abstract and abstruse thinking. The things of the mind may be sacrificed to the things of sense, the higher life of the soul may be stifled through the exaltation of self and the domination of selfish desires.

Unsensing the mind.

What is meant by unsensing the mind? It may mean, for instance, that the student of arithmetic is to be freed from the necessity of counting strokes or fingers in finding the sum or the product of two numbers; that the learner is to get away from the cats and dogs of the First Reader as soon as possible; that he is to be lifted by education to the plane on which he can think

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in abstract and general terms. In this sense it is correct to say that it is the purpose of education to unsense the mind. The phrase may also be interpreted to imply that the habit of thinking by means of visual images is to be got rid of. In this sense it is a dangerous maxim.

The first thinking of children is carried on in mental pictures. It is one of the aims of the school to lift the learner above this necessity of thinking in things by enabling him to think in symbols. These symbols are in their turn visualized; and we may have specimens of arrested development in the use of figures as well as in the use of fingers, blocks, or other objects employed in teaching the fundamental operations of integers and fractions. The principal of a well-known ward school aimed at great speed in arithmetical calculations. The results which his teachers obtained excited surprise and admiration. The test of progress was the number of digits that a pupil could add, or subtract, or multiply, or divide in a minute. The danger of this instruction became apparent when it was found that of five or six hundred children drilled in that way only one ever reached the high school, and she was only a third-rate student, who never acquired skill or proficiency in thinking in abstract and general terms. Mental energy was exhausted in the attempt to develop lightning calculators. There was no growth in the direction of thinking the laws and truths which make knowledge scientific.

Arrested development.

The untutored savage is guided by sense impressions; he thinks in mental pictures; he is incapable of a chain of reasoning like the demonstration of a theorem in geometry. Tribes have been found who could not count beyond three; any number in excess of two was called many or a multitude. Whilst their powers of observation were developed to a remarkable degree, they lacked the power of abstruse

The thinking of savages.

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thought. Their descendants, who are now at school, make rapid progress in knowledge which appeals to the senses; they find more than the usual difficulty in studies requiring demonstrative reasoning or sustained effort in scientific thought. Music is their delight; they can be taught to sing like birds in the air; their bands give sighs to brass itself. As in the eighteenth century the Iroquois, who would not submit to the doctrines of Christianity, were overcome by concerts, so, in the nineteenth, the missionaries of British Columbia appeal to the red man's ear for music in winning him for the Christian religion.

Popular audiences.

Language is full of faded metaphors which show how the things of the mind are conceived in images formed through the senses. Those who address popular audiences clothe their thoughts in figures of speech based upon the mental pictures in which the common people carry on their thinking. The ability to think in the language of science and philosophy is a later development, and those who by disuse or neglect impair their power to think in sense-images pay a penalty in losing, or never acquiring, the power to move the multitudes.

Mental pictures.

The power to think in mental pictures, or through the sense-impressions which memory recalls, varies in different persons. Occasionally the sense of touch is very active; the child in such cases manifests a desire to handle everything within reach, and undoubtedly gains impressions of peculiar strength answering its desire to know. A limited number of children in every school get their best impressions through the ear, and hence are said to be ear-minded; but the far larger proportion are eye-minded to the extent of connecting their most accurate knowledge with images obtained through vision. Similar peculiarities exist

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among older persons. A friend claims that he hears the voices of speakers while reading the proof-sheets of their speeches Another friend claims that he cannot bring up a mental picture of the faces of his children and his friends, but he writes out strains of music which he thinks and hears while seated on railway cars. The power of bringing up a vivid picture of the breakfast-table, or of some scene of special interest, is possessed by many persons. They live over again in memory the delights of travel, and enjoy scenery through the vivid mental pictures stored away in the treasure-house of memory. The ability to appreciate the best literature in prose and poetry depends largely upon the power of visualizing the realities at the basis of the descriptions and figures of speech. Francis Galton thinks that the perspicuous style of French literature and the wonderful manual skill of the French people is due to their power of thinking in visual images. He says,—

"The French appear to possess the visualizing faculty in a high degree. The peculiar ability they show in prearranging ceremonials and fêtes of all kinds and their undoubted genius for tactics and strategy show that they are able to foresee effects with unusual clearness. Their ingenuity in all technical contrivances is an additional testimony in the same direction, and so is their singular clearness of expression. Their phrase 'figurez-vous,' or 'picture to yourself,' seems to express their dominant mode of perception. Our equivalent of 'imagine' is ambiguous." * The French.

The profession of teaching owes Mr. Galton a special debt of gratitude for the light which his investigations throw upon the process of thinking. These investigations were published in a volume entitled "Inquiries

* F. Galton's "Inquiries into Human Faculty," pages 100, 101.

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into Human Faculty." When he began to inquire among his friends as to their power to call up mental pictures of the breakfast-table, those engaged in scientific pursuits were inclined to consider him fanciful and fantastic in supposing that the words *mental imagery* really expressed what he thought everybody supposed them to mean. He says they had no more notion of its true nature than a color-blind man who has not discerned his defect has of the nature of color. When he spoke to persons in general society, he got very different replies. Among other curious things which he discovered, he found that the power of thinking in sense-images, or mental pictures, may be partly inherited, partly developed by practice, and that it may be impaired by disuse or by the habit of hard thinking peculiar to men engaged in scientific pursuits. Scientific men, as a class, have feeble powers of visual representation. He reached the conclusion that "an over-ready perception of sharp mental pictures is antagonistic to the acquirement of highly generalized and abstract thought, especially when the steps of reasoning are carried on by words as symbols, and that if the faculty of seeing the pictures was ever possessed by men who think hard, it is very apt to be lost by disuse."

Galton's investigations.

He further claims that the visualizing faculty can be developed by education. This is very significant. It shows how unwise methods may harm our children in two directions. The wrong method may keep the mind at work in the concrete when the science under consideration demands more advanced and very different methods of thought. In the other direction the mind may be tied to words, descriptions, book methods, and symbolic representations, whereas the thinking which one's future duties demand points in the direction of drawing, mechanics, and handicrafts, in

Wrong methods.

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which success turns upon the power of thinking in visual images and mental pictures. One cannot forbear quoting his language in so far as it bears upon the thinking developed by schools for manual training in distinction from the thinking developed by the university which aims to fit its students for the professions and for scientific thought and experimental research.

"There can, however, be no doubt as to the utility of the visualizing faculty when it is duly subordinated to the higher intellectual operations. A visual image is the most perfect form of mental representation wherever the shape, position, and relations of objects in space are concerned. It is of importance in every handicraft and profession where design is required. The best workmen are those who visualize the whole of what they propose to do before they take a tool in their hands. The village smith and the carpenter who are employed on odd jobs employ it no less for their work than the mechanician, the engineer, and the architect. The lady's maid who arranges a new dress requires it for the same reason as the decorator employed on a palace, or the agent who lays out great estates. Strategists, artists of all denominations, physicists who contrive new experiments, and, in short, all who do not follow routine, have need of it. The pleasure its use can afford is immense. I have many correspondents who say that the delight of recalling beautiful scenery and great works of art is the highest that they know; they carry whole picture-galleries in their minds. Our bookish and wordy education tends to repress this valuable gift of nature. A faculty that is of importance in all technical and artistic occupations, that gives accuracy to our perceptions, and justness to our generalizations is starved by lazy disuse instead of being cultivated judiciously in such a way as will, on the whole, bring the

Thinking in images.

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best return. I believe that a serious study of the best method of developing and utilizing this faculty, without prejudice to the practice of abstract thought in symbols, is one of the many pressing desiderata in the yet unformed science of education." *

What is meant by the process of unselfing the will? If the maxim is interpreted to mean that education must eliminate the selfishness of the individual, and teach him to will and act for the good of humanity, especially of all with whom he comes in contact, the maxim points out an important end of education. If, on the other hand, the maxim is made to mean that the self, with its peculiarities, is to be sacrificed in the educative process, it carries a contradiction on its face. The lower self may have to be sacrificed in order that the higher self may be conserved. He that loseth his life shall save it; he that saveth his life shall lose it, is the teaching of Holy Writ.

Open a dictionary and search for words indicating how the belief in the necessity of emancipating life from the dominion of self has been woven into the very texture of the English language. Egotism, which originally meant the excessive use of the pronoun I, has come to signify all kinds of self-praise, self-exaltation, and to include all manner of parading one's virtues and excellencies; egoism denotes a state of mind in which the feelings are concentrated on self. Vanity and self-conceit are two words closely allied to the natural selfishness of the human heart. The former indicates the feeling which springs from the thought that we are highly esteemed by others; the latter is an overweening opinion of one's talents, capacities, and importance. There is another list of compound words, like self-denial, self-sacrifice, self-abnegation, which point to the importance of elimi-

* F. Galton's "Inquiries into Human Faculty," pages 113, 114.

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nating self and thoughts of self from the soul's activities in thinking and willing. Virtues like humility, love, service, sacrifice, are lauded in every Christian land. They are the Christian virtues exemplified by Jesus of Nazareth, who lived to do good to others, and who died that the sinning, sorrowing millions on earth might find peace and consolation for their troubled souls.

The unselfing of the will depends as much upon right thinking as does the unsensing of the mind. The untrained mind deals too much with things near at hand in the objective world; the uneducated will deals too much with the thing nearest to every man in the subjective world,—the individual self. The thought of self may enter so thoroughly into the feelings and activities of the soul that the rights of others are never thought of in the gratification of self and in the efforts at self-aggrandizement and self-glorification. Selfish desire and selfish ambition may dominate the soul and cause the individual to trample upon the dearest rights of others. The millions which some men heap up are squeezed from the productive toil of thousands, perhaps millions, of human hands. Colossal fortunes can seldom be made without reducing a considerable number of human beings to a condition of living from hand to mouth, to a state of chronic poverty. That the inordinate ambition of a masterful politician may be gratified, the hopes of other aspirants must be frustrated and their rights must be trampled upon. Hence in the end there is little happiness among office-holders and office-seekers. The selfishness of great conquerors is still more inexcusable. In the effort to gratify an unholy ambition the lives of thousands are sacrificed, their blood is spilt upon the battle-field, and their health is undermined by suffering and disease. If the men who send the soldier to the front were themselves compelled to sleep in ditches, or to

Selfishness.

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expose themselves to the fire of machine-guns upon the open field, wars would not be declared, or, if declared, would soon cease.

Self-sacrifice.

The higher life demands that the lower self be subordinated, regulated and sublimated in the education of man. The individual may be taught to find happiness in self-sacrifice for the sake of others, in deeds of love, charity, and benevolence. That this may result from the educative process, there should occur a change of heart, resulting in a change of view and in a transformation of the habits of thought so that self is seen in its true relation to mankind and to God, so that the things of time and sense shall stand in true relation to the verities of eternity and the interests of the higher life.

Self-development.

On the other hand, if the maxim is interpreted to mean that any gifts *or* powers of the self are to be sacrificed in preparation for a given calling, say for the army or navy, it becomes a dangerous heresy. The true end of education is found in the harmonious development of all our faculties. Every man is in one sense the product of countless ages and generations, and from another point of view he is a new creation fresh from the hand of his Maker, and a distinct setting forth of the creative power of Him who said, "Let us make man in our own image, after our likeness." As such he has a claim upon immortality, as well as upon all the help which earth can give him towards a full realization of self. Every person feels that there are possibilities of his being which are never realized in this world; that it will require the ceaseless ages of eternity to unfold and mature his God-given powers and traits. Any unselfing of the will in the sense of sacrificing or checking the growth and fruition of the best of which the self is capable, is a violation of Spencer's famous

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definition that education is a preparation for complete living.

What, then, is the relation of the imaging power to the proper unselfing of the will and the full realization of the self? "A great deal of the selfishness of the world comes not from bad hearts, but from languid imaginations." * To do justice to others, we must put ourselves in their place. This we cannot do except through the exercise of the imagination. The imagination is the creative power of the mind. By means of it we can create for our thinking the world in which our neighbor lives, and learn to understand his motives, aims, hopes, needs, and temptations. This will keep us from many a mistake in judging his conduct and estimating his character. Moreover, this thinking of ourselves into the life and surroundings of our fellow-men is a condition of success in dealing with them. It helps the merchant to sell his wares and the teacher to govern his pupils. It helps the orator to reach the hearts of the audience whom he is addressing, and the journalist to write editorials that will modify the views and mould the thinking of the reading public. Every profession and every occupation requires the constant exercise of the imagination so that we may see life from our neighbor's point of view, and, in sympathizing with him or helping him, outgrow our innate selfishness. A hard, cruel, unforgiving man makes a failure of life even though he win riches, fame, and public position.

Justice to others.

By means of the imagination we paint ideals of life and conduct, which hover before the mind in the hour of struggle and trial, luring us onward and upward, spurring us to greater effort, and giving to life added charms and glories. Without the power to im-

Ideals.

* James Freeman Clarke's "Self-Culture," page 183.

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agine what is beyond the real, the workman sinks to the level of drudgery, and never rises to the plane of artistic production.

The child's imagination.

The imagination is very active in children. Watch their plays if you would see how they convert a stick into a horse, the play-house into a home, and mimic the drama of life in their games and contests. Their life is largely make-believe and thinking in images. This tendency to think in images can be utilized in the lessons in arithmetic, geometry, geography, and history. Without the combination of images into new forms and products, the pupil cannot think the thoughts peculiar to these branches. For instance, the lesson in geography starts with what the child has seen or can see at home, and proceeds to that which is away from home, using pictures, drawings, lantern-slides, and vivid descriptions to aid the imagination in picturing scenery, cities, countries, and forms of life in other parts of the globe. It may be a question what the mind should think in connection with the symbols and truths of that science. The form of a continent is without doubt best conceived as given on a map. For many practical purposes, cities may be thought as mere starting-points and halting-places in a journey. Many a river is for mature minds a winding black line on colored surfaces called maps. Nevertheless, if geography means for a pupil no more than this, it will be dry and uninteresting indeed. Out of the images of things observed the mind should be led to construct images of what it has not seen. These images are never an adequate picture of the foreign city or country, even after they have been supplemented or modified by visits to museums, conservatories, and zoological gardens, by excursions to the field, the forest, and the factory, or even by travel at home and abroad. The thoughts of a country that one

Geography.

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has journeyed through, or lived in for a time, consist partly of images and partly of symbolic representations. Since thinking in images is easier for beginners than thinking in symbols, the instruction in geography should begin with child-life at home, with the things on the breakfast-table, with the garments worn and the means of transportation used, and proceed from these to the life, the home, the dress, and the sports of children living in other lands and other climes. The lessons in geography make constant appeals to the imagination, and call for thinking in images or mental-pictures in connection with map-symbols and the discussions of causes and laws.

History.

Not less valuable is the power of imaging in the study of history. Many details are worthless and meaningless until the imagination weaves them into a fabric in which their relations and significance become apparent. So far as the trend of history is concerned, it would have mattered very little if the name of the ship in which the Pilgrim fathers sailed had been Aprilshower instead of Mayflower, if the number of passengers had been one hundred and one instead of exactly one hundred, if they had landed at some place other than Plymouth Rock. Their coming, their compact, their religious life and purposes were of chief importance. Details help to fill out the mental picture of their voyage, landing, and settlement. They throw a halo of interest around the central event, or germinal idea. Or, to change the figure, they furnish the scaffolding by means of which the teacher gradually raises the edifice of historical knowledge. After the edifice has been completed the scaffolding may be removed. After the essential or central idea has been grasped and fixed, details like the name of the ship, the number of emigrants, and the exact day of their arrival may be forgotten. The mind can often

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from violating the laws and principles inherent in the things from which its materials are drawn. The understanding aids and is aided by this creative, plastic function of the imagination. The two should have free play in productive thinking. Let the student of science or art saturate himself with the theme on which he is working; let him keep health and energy of body and mind at their highest point; let him concentrate his best powers on what is to be accomplished, keeping clearly in mind the end to be reached and the materials to be used; the product for which he is working will spring into being in ways that he cannot explain. Like an unfathomable well which has been gathering its waters through hidden channels from mysterious sources, the stream of thought comes welling up from the depth of the soul into the conscious life of the thinker, giving him the living waters by which he can satisfy the thirst for knowledge felt by other souls. In expressing, formulating, and communicating the thoughts which thus come to him he cannot help feeling the "joy of creating." "The history of literature," says Shedd, "furnishes many examples of men whose knowledge only increased their sorrow, because it never found an efflux from their own minds into the world. Knowledge uncommunicated is something like remorse unconfessed. The mind, not being allowed to go out of itself, and to direct its energies towards an object and end greater and worthier than itself, turns back upon itself, and becomes morbidly self-reflecting and self-conscious. A studious and reflecting man of this class is characterized by excessive fastidiousness, which makes him dissatisfied with all that he does himself or sees done by others; which represses and finally suppresses all the buoyant and spirited activity of the intellect, leaving it sluggish as 'the dull weed that rots by Lethe's wharf.'"

Productive thinking.

Knowledge uncommunicated.

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No teacher and no system of training can furnish both brains and culture. It is not the mission of any person to create in every line of effort. Some find their joy in evolving and expressing thought with tongue or pen, others through the brush or the chisel, and still others through machinery and the handicrafts. In every occupation man may experience the joy of creating if his powers of imaging are allowed to play and interplay with other activities of thought. Each in normal conditions helps the others, and the activity of all combined is essential to complete living.

Forms of creative effort.

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XIII

THE STREAM OF THOUGHT

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At Learning's fountain it is sweet to drink,
But 'tis a nobler privilege to think;
And oft, from books apart, the thirsting mind
May make the nectar which it cannot find.
'Tis well to borrow from the good and great;
'Tis wise to learn; 'tis godlike to create!

J. G. Saxe.

Madame Swetchine says that to have ideas is to gather flowers: to think is to weave them into garlands. There could be no happier synonym for thinking than the word weaving,—a putting together of the best products of observation, reading, experience, and travel so as to represent a patterned whole, receiving its design from the weaver's own mind. We have plenty of flowers; we want more garlands. We have libraries, books, and newspapers; we want more thinkers.

T. Sharper Knowlson.

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XIII

THE STREAM OF THOUGHT

In speaking of our inner life we employ language that abounds in metaphors drawn from the external world. Some are faded metaphors; others are still fresh and new enough to suggest what was in the minds of those first using them. Many of these metaphorical expressions draw attention to one side or phase of the truth. If pressed with the design of making them embody the whole truth, they become untruths.

One fact of our waking consciousness is that thought goes on without stopping so long as we remain awake. Indeed, some philosophers have drawn the inference that the soul always thinks, that during the hours of deep sleep the brain-centres may be at rest, but that thought nevertheless flows on in the unconscious depths of our being. Locke combats this idea at length and with more than usual warmth. During sleep on a railway train we sometimes seem to be awake, the ends of our conscious thinking apparently fitting into each other without gaps; and yet the calling out of the stations convinces us that we must have been wrapped in unconscious slumber when we passed certain stations without noticing that the train stopped and the stations were announced. On the other hand, it is the experience of earnest students that the striking of a clock may escape notice because the mind has been deeply absorbed in a difficult problem.

The flow of thought.

The question need not concern us beyond the fact that the thinking of our most wakeful moments perpetually plays into our sub-conscious life. In order that the flow

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of thought welling up from the deepest depths of the soul may be clear, copious, and full, it is the duty of the teacher to keep himself and his pupils wide awake during the hours of study and recitation. He should not worry them by excessive tasks or unreasonable examinations so that the hours of sleep are disturbed by dreams, followed during the day by weariness and fatigue. The folly of burning the midnight oil and of spending too many hours each day in mental toil is fraught with evil consequences in the domain of thought. In the main Harbaugh was right when he undertook to change Franklin's maxim about early rising into the following form: "Go to bed early, and get up late; but then keep awake all day."

Teacher's duty.

So far as we are aware, thought is going forward continuously while we are awake. This phase of consciousness has been likened to a stream, and has given rise to the expression, *The stream of thought.* The metaphor can be pressed very far without conveying untruths. A stream does not always flow with the same velocity. It is at times deep, at other times shallow, now moving forward like a swollen torrent, now flowing placidly with scarcely a wave or a ripple perceptible on its surface. Here its smooth course is disturbed by wind and storm and rain; there its even flow is influenced by rocks and irregularities in the bed of the stream. Again and again its current is modified by affluents which empty their waters into the main stream, perhaps changing the appearance from clear to cloudy or muddy, or, it may be, exerting the opposite effect. To all these peculiarities in the flow of the stream there are likenesses in the stream of thought. At times it is deep and at other times shallow, now violent and disturbed, now calm and placid, sometimes clear to the bottom, sometimes cloudy, yea, muddy, always modified

Thought like a stream.

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more or less by influences from without, which are taken up into the main current of thought and alter the stream like the tributaries of a great river.

On reaching the level country a river may spread out into a lake, resulting in a clearing up of the water and resembling the periods of calm meditation during which the soul clarifies its thinking. The lifelike behavior of rivers and the carving of land forms from their youth through maturity to old age have furnished many a figure of speech for our poetic literature. The change from the active upper waters to the sedate lower current may typify the change in the stream of thought as we pass from youth to age. While the volume of the stream is small and the channel lacks depth, it is easy to change the direction of the current, as sometimes happens when a straight channel is dug to take the place of its windings. In early life the stream of thought is apt to wander in meandering courses; the teacher may very frequently find it necessary to keep the mind from wandering, to direct the stream of thought towards the destined goal, and to make it groove for itself channels in harmony with logical habits. In teaching pupils to think it is quite as essential to give direction to thought as it is to furnish either thought-stimulus or thought-material. In one respect the metaphor, stream of thought, fails utterly to express the truth. The constituents of thought are not related to each other like the molecules of a liquid which move freely among themselves. Thoughts have a connection with those that precede and those that follow. An inner nexus binds the successive portions of a demonstration. Hence other figures of speech have been employed to denote the connection between the successive elements of a logical proof, such as the train of thought, the line of argument, the chain of reasoning.

Early life.

Other metaphors.

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It will be readily admitted that often our thinking is so loose and disjointed that its component parts resemble the liquid more than the chain, whereas our best thinking—namely, that which leads to a goal in the shape of a trustworthy conclusion—resembles a train of cars in which motive power is derived not from steam, but from a conscious expenditure of will-power. The teacher may perform the triple function of fireman, engineer, and switch-tender, supplying the fuel for the process, regulating the speed, and directing it along the lines of track which lead to the desired goal. It is as natural for a pupil to think as it is for a stream to flow towards the ocean. The stream may run shallow if no supply of water is received from the outside. It is the mission of the teacher to keep up the supply, to remove as far as possible the obstructions which are likely to throw the current of thought into unexpected channels. It is a peculiarity of this current of thinking that it is cognitive, or possesses the function of knowing. Human thought resembles the stream in seemingly taking up and carrying what was not a part of itself. Just as the stream of water carries minerals in solution as well as silt, sand, pebbles, and even heavier objects, so the stream of thought appears to lay hold of objects and to carry them as part of itself. Here, however, the strings of the analogy break. The stream of thought is in the mind; the objects with which it deals are outside of the mind. Mental pictures of these objects float in the stream of thought as objects on the bank of a river are mirrored in its waters; yet the parallel is not complete, because the mind may turn the eye upon itself and make what is thus seen the object of thought. This turning upon itself may be likened to eddies in the stream. But even when the mind thus turns back upon itself and views its own states and activities, these are

Cognitive function.

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regarded as objective, as related to the thinking process very much like the objects of knowledge in the external world.

Another important phase of thinking finds no likeness in any of the figures of speech above referred to. The mind meets certain objects of thought on which it seems to tarry or fasten itself. This has led some writers to deny that the stream of thought is a continuous current. This view causes undue stress to be laid upon the material of thought, and leads the teacher to undervalue his function as directing guide in teaching pupils to think. Even Professor Bain claims that,—

"The stream of thought is not a continuous current, but a series of distinct ideas, more or less rapid in their succession, the rapidity being measurable by the number that pass through the mind in a given time. Mental excitement is constantly judged of by this test; and if we choose to count and time the thoughts as they succeed one another, we could give so much more precision to the estimate." *

Bain's view.

These transitions should not be confounded with the relations between objects of thought or between objects in the external world. The relations may be part of the thought of that which is perceived or known, or they may be made distinct ideas or thoughts. The important phase under consideration is the passage of the mind from one idea or thought to another. Such transitions are quite as important and quite as much a part of the current of thought as the premises and conclusions on which the mind seems to rest. These two phases of the thought-process may be likened to the perching and the flight of a bird. This figure of speech is used by Professor James, among

Transitions.

* Bain's "The Emotion and the Will," page 29.

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whose services to the profession of teaching it is not the least that he has called attention to the importance of these transitions in the stream of consciousness. His account is so lucid and satisfactory that one cannot forbear to quote his words at some length. Referring to the stream of thought, he says,—

Two phases.

"Like a bird's life, it seems to be made up of an alternation of flights and perchings. The rhythm of language expresses this, where every thought is expressed in a sentence and every sentence closed by a period. The resting-places are usually occupied by sensorial imaginations of some sort, whose peculiarity is that they can be held before the mind for an indefinite time and contemplated without changing; the places of flight are filled with thoughts of relations, static or dynamic, that for the most part obtain between the matters contemplated in the periods of comparative rest. *Let us call the halting-places* the 'substantive' parts and the places of flight the 'transitive' parts of the stream of thought. It then appears that the main need of our thinking is at all times the attainment of some other substantive part than the one from which we have just been dislodged. And we may say that the main use of the transitive parts is to lead us from one substantive conclusion to another. Now it is very difficult, introspectively, to see the transitive parts for what they really are. If they are but flights to a conclusion, stopping them to look at them before a conclusion is reached is really annihilating them. Whilst if we wait until the conclusion be reached, it so exceeds them in vigor and stability that it quite eclipses and swallows them up in its glare. Let any one try to cut a thought in the middle and get a look at its section, and he will see how difficult the introspective observation of the transitive tract is. The rush of the thought is so head-

View of Professor James.

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long that it almost always brings us up at the conclusion before we can arrest it. Or if our purpose is nimble enough and we do arrest it, it ceases forthwith to be itself. As a snow-flake crystal caught in the warm hand is no longer a crystal, but a drop, so, instead of catching the feeling of relation moving to its term, we find we have caught some substantive thing, usually the last word we were pronouncing, statistically taken, and with its function, tendency, and particular meaning in the sentence quite evaporated. The attempt at introspective analysis in these cases is, in fact, like seizing a spinning top to catch its motion, or trying to turn up the gas quickly enough to see the darkness. And the challenge to *produce* these psychoses, which is sure to be thrown by doubting psychologists at any one who contends for their existence, is as unfair as Zeno's treatment of the advocates of motion, when, asking them to point out in what place an arrow *is* when it moves, he argues the falsity of their thesis from their inability to make to so preposterous a question an immediate reply." *

The science of logic deals almost altogether with the halting-places, with the substantive parts, with the ideas, notions, concepts that are to be compared, and with the resulting judgments, inferences, and conclusions. Whether the teacher has studied the science of logic or not, it is to these he devotes his chief attention; they can be analyzed, defined, and clearly fixed as thought-products or knowledge. Defects in the thinking-process are apt to show themselves here; at least, they furnish tangible data for criticism, corrections, and reviews. These thought-products on which the mind loves to linger are denoted by nouns, verbs, adjectives, and adverbs,—the parts of speech which con-

Nouns, verbs, etc.

* James's "Psychology," vol. i., pages 243, 244.

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stitute the bulk of the vocabulary of every language. The movements of the mind from one object of thought to another are indicated by conjunctions and other connectives. Thinkers are often known by their favorite connective words and phrases. Pupils catch these from the phraseology of their teachers, or pick them up unconsciously from the books they read. Some languages are richer in such connective words and phrases than others; the mind carries away some influence in the way of making these transitions in thought from every language which it studies; its thinking is moulded by the language which it masters. Logic has very little to say about these transitions for which one language sometimes supplies words and expressions altogether wanting in another. Frequently we grow conscious of them through the feeling of a gap to be filled, or of a chasm to be leaped over, or of an obstacle to be cleared away, or of something that obstructs our thinking and hinders it from reaching the goal. Here again one cannot refrain from quoting Professor James, although his words do not indicate that he fully realizes the value for elementary instruction of what he has written. Here are his words:

Connectives.

"The truth is that large tracts of human speech are nothing but *signs of direction* in thought, of which direction we, nevertheless, have an acutely discriminative sense, though no definite sensorial image plays any part in it whatsoever. Sensorial images are stable psychic facts; we can hold them still, and look at them as long as we like. These bare images of logical movements, on the contrary, are psychic transitions, always on the wing, so to speak, and not to be glimpsed except in flight. Their function is to lead from one set of images to another. As they pass, we feel both the waxing and the waning images in a way quite different from the way of

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their full presence. If we try to hold fast the feeling of direction, the full presence comes, and the feeling of direction is lost. The blank verbal scheme of logical movement gives us the fleeting sense of the movement as we read it, quite as well as does a rational sentence awakening definite imaginations by its words." *

Right here the teacher who is an artist finds the opportunity for the display of his highest skill. It is his privilege to direct the flights and the perchings of the youthful mind. He can shape the thoughts and their sequence. He can cause the intellect to move from the reason to its consequence, or in the reverse direction if that be more natural or more appropriate. He can guide the thought from cause to effect, from the whole to the parts, from the general to the particular, from the end to the means, from the design to its execution; or a movement the other way is possible in each of these categories. While thus choosing the direction which thought shall take, he can select the objects upon which it shall tarry. This directing influence he will often exert when he is not aware of it. His own habits of mind will be reflected in the mental life of his pupils. There was profound philosophy in the reply of a gifted author who, when asked by his daughter what she should study, said, "I am more concerned about the teachers under whom you study than about the branches of study which you may select." Habits of thought depend far more upon the teacher than upon the text-book, upon the quality of the instruction than upon its general content. There is, of course, a difference in the culture value of different branches of study; but a study as valuable as geometry may be pursued in a loose way, whilst branches of much inferior value for developing

Directing the youthful mind.

* James's "Psychology," vol. i., page 253

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power to think may be taught and studied by the methods of rigid and exact thought.

In shaping the activity of thought, the artist-teacher makes the mind tarry long enough for clear apprehension, sometimes for thorough comprehension, upon the ideas, judgments, and conclusions which are the framework of a system of thought, but he does not neglect the transitions from one to the other, as if these were of little account or necessarily took care of themselves. The transitions in thought are aided by set phrases and forms of solution. As soon as these are mastered, there develops the tendency to think them as algebraic symbols, which do substitute duty in the absence of that for which they stand. For fear of this, the teacher sometimes fails to drill on them long enough to fix them in the mind,—certainly a radical mistake. Drill is a condition of the highest discipline in the school as well as in the army. The drill-master seeks to habituate the soldier to the word of command, so that he will obey in the face of danger without thinking of the consequences. The drill-master at school seeks to make it second nature for a pupil to go through the logical motions, but not without conscious thought of the process or the consequences. Whenever the learner uses forms of parsing, analysis, or solution, his mind should go through the movements of thought expressed by the language. Ask any ordinary class to give you a noun of the first person; they are almost sure to give you either a noun of the third person or a pronoun of the first person. Dictate a sentence with a noun in the first person, and ask the pupils to parse it in the customary way; in nearly all cases they will parse it as a noun of the third person. Ask them to tell why a personal pronoun is so called; frequently they say because it indicates a person,—a statement quite applicable

The artist-teacher.

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to other kinds of pronouns. If the logical or customary forms of speech are employed, the stream of thought moves on, the mind often failing to perceive the new truth, or error, or nonsense inherent in the language employed. School-boys have tricks of their own which turn upon this peculiarity in the movement of thought. "Who killed Cain?" is suddenly asked. "Abel," is the reply generally elicited by the question. Should you say, Nine times seven *is* or *are* forty-two? The boy who decides in favor of *is* or *are* gets a shock of surprise on being told that the product of nine times seven is not forty-two.

Forms of speech.

One day a teacher was lecturing upon education in the dark ages. To show how the energies of the common people were exhausted in the struggle for existence, the resolution of a synod in the south of France was cited. The resolution enjoined upon the bishops the duty of seeing to it that during a period of scarcity of food the peasants were at least provided with bread made of acorns. A few minutes later a reference was made to the autobiography of Thomas Platter, in which certain things are described as happening about the time of the Diet of Worms. On being asked in what period of history that was, a pupil promptly replied, "When the common people were fed on worms."

A strange reply.

Very much of the sermonizing of our day gives rise to the same kind of thinking. The mind is borne along by the customary flow of words. The phrases used have an orthodox sound; perhaps they are biblical in the sense that they occur in the Bible. It is impossible to tell whether any clear idea or real religious experience is suggested to the hearer's mind by the words used. The ideas excited in the hearer should be those for which the words stand in the mind of the speaker. If the ideas of the speaker are not clear, how

Biblical phraseology.

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can his words suggest anything definite to the audience? Huxley relates an amusing story of an after-dinner orator who was endowed with a voice of rare flexibility and power, and with a fine flow of words, and who was called upon to speak without much preparation. The applause was terrific. When Huxley asked a neighbor who was especially enthusiastic what the orator had said, the latter could not tell. Nothing was lacking in the post-prandial speech save sense and occasionally grammar.*

Huxley's story.

The fuller consideration of the stream of thought in listening and lecturing, in reading, speaking, and composing, is deserving of separate chapters. The mental attitude in listening resembles that in getting thought from the printed page. Silent reading is for the reader's own benefit; it comprises by far the larger proportion of our reading. In oral reading, the stream of thought is somewhat different, the aim being similar to that of public speaking,—namely, to suggest or convey to the hearer thoughts from some other mind. In the act of composing, the aim is to evolve thought from the mind's own resources and activities. The thought process is very much the same, no matter whether we dictate to a stenographer, or speak to an audience, or use the pen in giving to it form and abiding shape. It will be most convenient to treat together the stream of thought in listening and in silent reading, and to reserve for separate consideration the activity of the mind in writing, speaking, and oral reading.

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* Huxley's "Discourses, Biological and Geological Essays," pages vi, vii.

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XIV

THE STREAM OF THOUGHT IN LISTENING AND READING

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Reading is thinking along a prescribed line that lies goldenly beneath the flow of words.

BRUMBAUGH.

Whittier uses words as stepping-stones upon which with a light and joyous bound he crosses and recrosses at will the rapid and rushing stream of thought.

LONGFELLOW.

To listen well is to think well,—the hearing ear must be attended by the alert mind, eager to seize upon incoming sensations and weave them into a garland of thought.

M. G. B.

Words, however well constructed originally, are always tending, like coins, to have their inscription worn off by passing from hand to hand; and the only possible mode of reviving it is to be ever stamping it afresh by living in the habitual contemplation of the phenomena themselves, and not resting in our familiarity with the words that express them.

J. S. MILL.

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XIV

THE STREAM OF THOUGHT IN LISTENING AND READING

A suggestive dialogue.

Two men engaged in speculative pursuits met after one had published a book. Let us speak of them as A and B.

A: I have just read your new book. Many things in it please me very much, but in it you say so and so, with which I do not find myself in full accord.

B: I say nothing of the kind in that book.

A: I surely read your book.

B: You never read a book in your life. You read some sentences or paragraphs; your mind begins to react upon what you have read; and ere long you imagine that your inferences are the conclusions of the author.

A: I have a notion to write a psychology, and to set forth my views in full.

B: Don't you do it. You know no psychology. You have been of great service in stimulating others to think; you are a most delightful lecturer; but you have never mastered psychology.

Feeling.

If a third party could have listened to the conversation, what stream of consciousness would have started in his mind? Possibly surprise at the frankness of B and the composure of A, mingled with thoughts of what they were discussing. In other words, a strong tinge of feeling would be perceptible in the stream of thought. In the minds of the two engaged in the dialogue, feeling must have greatly modified the current of thought. The greatest kindness that can be shown to

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some men is to oppose or criticise their views. Opposition and criticism stimulate their thinking, and rouse their mental powers to the highest possible tension and activity. In men of the opposite temperament, feeling beclouds their thinking, and makes the stream of thought more sluggish. The common prejudice against appeals to feeling are due to the abuse of the right which every orator has of addressing the feelings through the intellect, and of thereby moving the will. To move the will is the essence and aim of all eloquence. In listening or lecturing, in reading or composing, some form of emotion always accompanies the stream of thought. The orator may move the hearer to tears or to laughter; he is not untrue to his mission if he can thereby win a vote, secure a verdict, or move the hearer to action. A lecture is addressed primarily to the understanding. It is greatly improved if the stream of thought which it starts and supplies is accompanied by feelings of interest and the pleasurable emotions attendant upon novelty, curiosity, or admiring approval. The consciousness that we understand a lecture is accompanied by pleasurable emotions which help to sustain the attention.

Interest.

The writer once paid a shilling to hear Spurgeon. It was his purpose to get a good seat, so that he might study this famous preacher's gestures and delivery, the quality of his voice, and the secret of his eloquence. The text was hardly announced before every one in the audience, including the writer, forgot all about Spurgeon, and thought only of his message to the thousands before him. The secret of his oratory lay in his ability to make the audience forget everything except the gospel he was preaching. If people, after hearing a speaker, talk of his fine delivery, his flowery language and beautiful figures of speech, or

Spurgeon.

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his peculiarities of pronunciation and other eccentricities, it is proof positive that he has failed. Instead of holding the attention to what he was saying, the audience was thinking of his manner and delivery. A well-printed book has the advantage of keeping the author's personal characteristics from interfering with the stream of thought. It has the disadvantage of losing all the helps to listening and thinking which come from the tones of the voice and eloquent delivery.

The accusation of B against A, referred to at the beginning of this chapter, is applicable to many readers. For several sentences the mind is riveted upon the author's meaning. Presently a train of thought starts; the eye runs along the sentences to the bottom of the page. On turning the page, the reader wakes up to the consciousness that his mind does not retain, perhaps never had the slightest notion of the contents of said page. Often the train of thought leads to no goal; the thinking resembles the process of wool-gathering, the tufts of wool on bushes and hedges necessitating much wandering to little purpose.

The works of great thinkers.

For the sake of cultivating ability to think, students are advised to read the works of great thinkers, like Kant, Schleiermacher, and Hegel. Such reading is often a sham and a delusion. No one has done more to shape the critical thinking of the world than Kant; and yet how many young men waste time upon his pages because they are not prepared to think his thoughts. Schleiermacher stimulated and modified the thinking of theologians in every department of their science except Old Testament exegesis; and yet the celebrated Dr. Kahnis, of the University of Leipsic, used to say of Schleiermacher, "Er ist rein nicht zum studiren." Nevertheless, students for the ministry have been known to waste hours in trying to read his writings,

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which they were not prepared to understand. Of the obscurer passages in Hegel an eminent authority says, "It is a fair question whether the rationality included in them be anything more than the fact that the words all belong to a common vocabulary, and are strung together on a scheme of predication and relation,—immediacy, self-relation, and what not,—which has habitually recurred. Yet there seems no reason to doubt that the subjective feeling of the rationality of these sentences was strong in the writer as he penned them, or even that some readers by straining may have reproduced it in themselves." *

It may be worth an honest effort for students and teachers to try to grasp the meaning of such writers; but if after a fair trial the mind is left empty of meaning, it is wise to follow the advice of Locke with regard to obscure ancient authors:

"In reading of them, if they do not use their words with a due clearness and perspicuity, we may lay them aside, and, without any injury done them, resolve thus with ourselves:

* James's "Psychology," vol. i., page 264. Of Charles Darwin's habits of reading, his son says, "I have often heard him say that he got a kind of satisfaction in reading articles which (according to himself) he could not understand. I wish I could reproduce the manner in which he would laugh at himself for it." Of his scientific reading, this son writes as follows: "Much of his scientific reading was in German, and this was a great labor to him; in reading a book after him, I was often struck at seeing, from the pencil-marks made each day where he left off, how little he could read at a time. He used to call German the 'Verdammte,' pronounced as if in English. He was especially indignant with Germans, because he was convinced that they could write simply if they chose, and often praised Dr. F. Hildebrand for writing German which was as clear as French."—"Life and Letters of Charles Darwin," vol. i., page 103.

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"Si non vis intelligi, debes negligi." *

Several months or years of study may be required to prepare the mind for grasping the ideas or phraseology of new departments of investigation. No one can comprehend the treatises on physiological psychology without devoting several weeks to the anatomy of the brain.

The words, phrases, and sentences of the printed or written page should call up in the mind of the reader that for which they stand in the mind of the author. What the stream of thought should be in reading a book is well worthy of careful consideration. G. H. Lewes, in "Problems of Life and Mind," claims that "our thought is a constant interchange of ideas and images, some trains of thought being carried on mainly by images more or less vivid, others mainly by ideas with only a faint escort of images." It should be said, by way of explanation, that he does not use the word "ideas" in the Platonic sense of patterns fixed in nature, of which the individual objects in any given class are but imperfect copies, and by participation in which they have their being; nor in the sense of a mental image or picture, which (in opposition to Sir William Hamilton), the Century Dictionary claims, has been the more common meaning of the term in English literature since the sixteenth century. In Lewes's pages ideas never stand for images, nor for copies of sensations. Sully says that the term idea is used to include both images and concepts, marking off the whole region of the representative from the presentative, but that, like the term notion, it now tends to be confined to concepts. With Lewes all ideas are thoughts, but not all thoughts are ideas. He does not reject the popular usage of the word in phrases like the idea of Shakespeare's Othello, of Bis-

Reading.

* Locke's "Human Understanding," vol. ii., page 85.

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marck's policy. Take the following sentence from Justin McCarthy's "History of Our Own Times:" "Unluckily, Lord Palmerston became possessed with the idea that the French minister in Greece was secretly setting the Greek government on to resist our claims." In thinking the thought of this sentence the mind is not filled with any images of Greece or mental pictures of any other kind. Possibly the adjective Greek may bring to the minds of some persons the map symbol of Greece or even scenery and cities in Greece, especially if they have travelled or resided there; but such mental pictures really interfere with the current of thought in reading. In planning a route from New York to San Francisco one is apt to think it in the lines and dots of railway maps. That in the mind for which words stand may be styled their meaning, and Lewes claims that much of our reading does not translate the words into their full signification, but proceeds by a process of logical symbolism. He asserts that "the greater proportion of all men's thinking goes forward with confident reliance on the correctness of the logical operations, and with only an occasional translation of symbols into images. The translation—verification—does, indeed, from time to time take place, and always in proportion to the novelty of the connections; but how easily and how fatally the mind glides along the path of logical operation without pausing to interpret more than the relation of the symbols is humorously illustrated in the common story of a physicist, whose claim to omniscience was the joke of his friends. Being asked earnestly whether he had 'read Biot's paper on the malleability of light?' 'No,' he replied; 'he sent it me, but I have not yet had time to read it.'"

Lewes's view.

Lewes's meaning is made somewhat clearer by two examples which he uses. "Suppose you inform me

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that the blood rushed violently from the man's heart, quickening his pulse, at the sight of his enemy. Of the many latent images in this phrase, how many were salient in your mind and in mine? Probably two,—the man and his enemy,—and these images were faint. Images of blood, heart, violent rushing, pulse, quickening, and sight were either not revived at all or were passing shadows. Had any such images arisen, they would have hampered thought, retarding the logical process of judgment by irrelevant connections. The symbols had substituted *relations* for these *values*,—the logical relations of inclusion and exclusion which constitute judgment. You were not anxious to inform me respecting the qualities of blood, heart, pulse, etc., but only of a certain effect produced on one man by sight of another; and this effect you expressed in the physiological terms which came first to hand; you might have expressed it equally well in very different psychological terms,—'fierce anger seized the man's soul, rousing all his energies at the sight of his enemy,' when assuredly there would not have been present images of 'anger,' 'seizing,' 'soul,' 'rousing,' and 'energies.' These terms are symbols which stand for clusters of images, and can at will be translated into images, just as algebraic letters stand for values which can be assigned. But for purposes of thought and calculation such translation is unnecessary, is hampering; all that is necessary is that the terms should occupy their proper logical position." * An example.

The other example is still more striking. "Suppose I read the phrase, 'The ship which carried Nelson was appropriately named the Victory;' unless the ship itself is

* Lewes's "Problems of Life and Mind," Fourth Problem, pages 474, 475.

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the prominent interest, I have probably no image at all, or at least only a faint and fleeting shadow of some vague outline. I do not picture a man-of-war, I do not see the hull, masts, cordage, and cannon, though these, with the figure-head, fluttering flags, and pennons, may successfully emerge if I dwell on the ship. I perhaps do not see Nelson, or, at any rate, do not see his pale face, one eye, and one arm, but only some faint suggestion of a human form. The purpose of the phrase was not to raise images, but to communicate a fact respecting the name of the ship; and my intelligence has been occupied with this purpose. I must, it is true, have understood each word, or, at any rate, each clause of the sentence; but for this understanding it is not necessary that I should translate, nor even that I should be capable of translating, each word into an image or cluster of images; it is enough if I apprehend a series of logical relations. We all use occasional words with intelligent and intelligible propriety, the meaning of which as isolated terms we cannot translate. We read Shakespeare and Goethe without a suspicion of the many words which for us have no images. But if one of these words occurs in an unfamiliar connection we are at once arrested, as we are if any familiar word is placed in an unfamiliar position. Suppose we come upon the sentence, 'The ship which carried Nelson was named *Victory;* the ship which carried Napoleon across the desert was named *Akbar*,'—we are at once arrested; the connection of ship and desert is unusual, and is seen, on reflection, to be contrary to experience; but when we learn that the camel is called the ship of the desert,' we recognize the new value assigned to the term, and the logical correctness of the phrase is thereby recognized." *

Another example.

* Lewes's "Problems of Life and Mind," Fourth Problem, pages 475–477.

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These examples, and others like them which Lewes gives, bring us face to face with the proposition that "much of our thinking is carried on by means of symbols without any images, which is the same thing as thinking being carried on by words without any meanings and with only the accompanying intuition of their logical relations." Thus, after a century of exhortation against the blind use of words we are brought face to face with the question of using words in thinking without realizing the full meaning, an abuse of words for which reformers have shot their arrows at rote teaching from every possible point of view. What truth is there in the statement of Mr. Lewes? What can be his meaning?

It must be admitted that men in mature life skim newspapers, magazines, and books, especially books of fiction and books of reference, without realizing in their minds the import of all the words upon which the eye falls. The aim may be to get the plot of the story or a fact for some specific use, or a hurried view of the news and current events of the last twenty-four hours. But this is not the kind of thinking which the teacher aims to beget in the minds of his pupils. Nor does it ever lead to a just appreciation of literature.

Literature.

All literature which appeals to the imagination cannot be read and enjoyed in that way. No one can rightly read a choice selection without thinking what was in the author's mind, reconstructing the images and scenes which were before his mental eye and following the movements depicted by his language. Movement is more easily conceived than scenery, and abounds in the stories which are most popular among children. Judicious exercises will soon enable the pupil to call up all kinds of imagery. In the Standard Fifth Reader it is suggested that the pupils sit with closed eyes and close attention while the teacher

Imaging in poetry.

The correct plan.

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or one of the pupils reads a paragraph or stanza. For illustration, Kate Putnam Osgood's poem, entitled "Driving Home the Cows," is selected.

Out of the clover and blue-eyed grass
He turned them into the river lane;
One after another he let them pass,
Then fastened the meadow bars again.

Under the willows and over the hill
He patiently followed their sober pace;
The merry whistle for once was still,
And something shadowed the sunny face.

Only a boy! and his father had said
He never could let his youngest go;
Two already were lying dead
Under the feet of the trampling foe.

But after the evening's work was done,
And the frogs were loud in the meadow-swamp,
Over his shoulder he slung his gun,
And stealthily followed the foot-path damp;

Across the clover and through the wheat,
With resolute heart and purpose grim;
Though the dew was on his hurrying feet
And the blind bat's flitting startled him.

Thrice since then had the lanes been white,
And the orchard sweet with apple-bloom;
And now, when the cows came back at night,
The feeble father drove them home.

For news had come to the lonely farm
That three were lying where two had lain;
And the old man's tremulous, palsied arm
Could never lean on a son's again.

The summer days grew cool and late:
He went for the cows when the work was done;
But down the lane as he opened the gate
He saw them coming, one by one:

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Brindle, Ebony, Speckle, and Bess,
  Shaking their horns in the evening wind;
Cropping the buttercups out of the grass;
  But who was it following close behind?

Loosely swung in the idle air
  An empty sleeve of army blue;
And worn and pale, from the crisping hair,
  Looked out a face that the father knew.

The great tears sprang to their meeting eyes,
  For the heart must speak when the lips are dumb;
And under the silent evening skies
  Together they followed the cattle home.

Who can fully appreciate these stanzas without picturing the landscape of clover, blue-eyed grass, meadow bars, river lane, cows moving homeward, and especially the boy with the shadow on his face, the two older brothers lying dead under the feet of the trampling foe? The subsequent parts of the poem lend themselves to the activity of the imagination, to a play of sympathy for the father seemingly bereft of all his sons, until on a summer day cool and late he sees fluttering in the wind an empty sleeve of army blue, beneath a face that he knew,—a scene which, if constructed by the imagination, cannot help stirring the emotional life of the reader and giving him proper tones and inflections in oral reading while more fully realizing the price paid in war for the saving of the nation. Very much of our thinking does not turn on images or mental pictures. We do not primarily think justice, law, kindness, mercy under the form of images, though by a secondary process we can throw these ideas into concrete examples and image them as occurring in life. Very many ideas cannot be made concrete in that way, as, for example, the ideas of infinity, eternity. Sometimes an indistinct or faded image does duty for the idea

Some thoughts are not images.

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of horses in general, but in such cases the image is representative of the idea, and should not be confounded with the idea. Both are thoughts, but not all thoughts are ideas or images. Many thoughts are propositions and cannot be imaged at all.

Putting content into words.

The images which go with words grow in fulness as one's experience enlarges. Take the word fire. The first idea was formed from fire in the stove and in the smithy. A fuller idea resulted from the sight of a distant mountain on fire. Then a distant conflagration resulting in the loss of a block of town property gave the word still fuller content. Finally, the destruction of the State Capitol, in which part of the manuscript of a book, other valuable papers and records were destroyed, and in which one or two friends almost lost their lives, gave a meaning to the word fire which it never had before. Without doubt it hampers the mind and impedes the logical processes of thought if the word invariably calls up the idea of these fires with the accompanying emotions.

Books on mathematics and other sciences.

We saw the value of the labor-saving devices introduced by the symbols and formulas of mathematics and other sciences. Analysts carry forward long trains of thought by means of symbols whose meaning can be, but is not always, called up with the successive links of the chain of reasoning. In adding a column of figures, in solving an algebraic equation, in reading a work on higher mathematics or logic, in thinking the formulas of chemistry, physics, astronomy, etc., and in dealing with objects, forces, and relations which have been accurately and definitely quantified, the thinking may be carried forward by the use of symbols which can be interpreted and applied whenever the occasion requires, but whose meaning is not always present to the mind. In reading of

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things which have not been quantified, the stream of thought often flows on without images, or mental pictures, or copies of sensations. Nevertheless, the examination of any school reader or book of selections from the best literature will show how our best writers and orators appeal to the imagination, and to what a large field the method of thinking in images or mental pictures is applicable for the purpose of securing due appreciation of good literature and proper expression in oral reading.

The simplest thinking is the comparison of objects when these are present to the senses. It prevails largely in the handicrafts and in the ordinary duties of life. More difficult is the comparison of images or mental pictures of things when these are not present to the senses, but must be recalled by the memory. This thinking is essential to the appreciation of poetry, to the vivid presentation of thought, and should not be neglected by those who wish to move the multitudes with tongue or pen. "Imaging," says Dryden, "is in itself the very height and life of poetry, which, by a kind of enthusiasm or extraordinary emotion of the soul, makes it seem to us that we behold those things which the poet paints." Higher, from the scientist's point of view, is the thinking in substitute symbols which stand for ideas definitely fixed or quantified. Higher still is the comparison of abstract and general ideas through expressive symbols, including their application to the problems of life; for this is the kind of thinking that characterizes the scientist and the philosopher, the engineer and the surgeon, the editor and the orator, and, in fact, all whose vocation has risen to the rank of a profession. But highest of all is the thinking which creates and invents, begetting progress in science and art, in literature and history, in government and civilization.

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XV

THE STREAM OF THOUGHT IN WRITING, SPEAKING, AND ORAL READING

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The highest joy is the freedom of the mind in the living play of all its powers.

SCHILLER.

The historian Niebuhr, speaking of the historian's vocation, remarks that he who calls past ages into being enjoys a bliss analogous to that of creating. With still more truth may we say of that mind which is able, in the conscious awakening of all its powers, to give full and satisfactory utterance to its thick-coming thoughts, that it enjoys the joy of a creator. If there is one bright particular hour in the life of the educated man, in the career of the scholar, it is that hour for which all other hours of student-life were made,—that hour in which he gives original and full expression to what has been slowly gendering within him.

SHEDD.

Unless a man can link his written thoughts with the everlasting wants of men so that they shall draw from them as from wells, there is no more immortality to the thoughts and feelings of the soul than to the muscles and bones.

BEECHER.

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XV

THE STREAM OF THOUGHT IN WRITING, SPEAKING, AND ORAL READING

EVENTFUL in his career is the day on which a young person speaks in public for the first time. His hands and arms are in his way; his lower limbs quake; his lips and throat feel dry and parched; the vocal organs refuse to obey his bidding; he experiences other discomforts which he cannot explain and which are due to embarrassment and nervousness. What is worst of all, he cannot tell what has gone wrong in his mind. If his speech was committed, the memory fails to recall some word or sentence that seems absolutely essential to the sequence of thought. If he speaks extemporaneously, the stream of thought stops flowing, or turns back in eddies, or perhaps spreads out over all the land instead of moving towards the proper goal. In fact, all these annoyances have their fontal source in the mind, in a play of emotions in which stage-fright is the principal element. To this young man some trusted friend should whisper, "Take courage;" for if ever in his life a young man needs encouragement it is when he makes his first speech or preaches his first sermon.

The first speech.

Public speakers are made, not born. Native talent is helpful, but not all sufficient. Most of the obstacles to success disappear as soon as one has learned to think on his feet; that is, to control the stream of thought when facing an audience.

Public speakers are made, not born.

There are, of course, exceptions to all rules. Some

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young men possess an amount of self-confidence which is proof against embarrassment. Such youth are sometimes gifted with a flow of words that is fatal to ultimate success. It enables them to fill time without previous preparation. Bautain describes a "fatal facility a thousand times worse than hesitation or than silence, which drowns thought in floods of words, or in a torrent of copiousness, sweeping away good earth and leaving behind sand and stones alone. Heaven keep us from these interminable talkers, such as are often to be found in southern countries, who deluge you, relatively to anything and to nothing, with a shower of dissertation and a down-pouring of their eloquence. During nine-tenths of the time there is not one rational thought in the whole of this twaddle, carrying along in its course every kind of rubbish and platitude. The class of persons who produce a speech so easily and who are ready at the shortest moment to extemporize a speech, a dissertation, or a homily, know not how to compose a tolerable sentence; and I repeat that, with such exceptions as defy all rule, he who has not learned how to write will never know how to speak." *

Dangers of fluency.

No one stands in greater need of the discipline derived from the use of the pen than those who overflow with words and sentences. Their dearth of ideas can be remedied in no other way. The sentence which escapes from the lips is fleeting and soon forgotten. The sentence in black and white, which stares you in the face from the written page, can be read and re-read until its lack of sense and its wealth of nonsense and absurdity grow too glaring to be endured. Paragraph after paragraph can thus be tested, condensed, and stuffed full of meaning. This discipline ultimately enables a fluent talker to speak

* Bautain's 'Art of Extempore Speaking," pages 68, 69.

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with force and to the point, because it gradually transforms his habits of thinking, deepening the stream of thought and enabling it to carry craft too weighty to be borne by a shallow stream.

Hesitating speakers.

The person who is afflicted with hesitation and embarrassment also stands in sore need of the discipline of writing. In the solitude of the home one can take time to find and fix the right word, to weave it into sentences that stand the test of grammar, logic, and rhetoric, and to arrange a line of thought from which everything irrelevant is excluded. Embarrassment vanishes with the advent of the feeling that one has something to say. The growth of language, which invariably accompanies the evolution and clarification of thought, corrects hesitation. Soon the hands drop to the side or obey the will in gesture, and the feeling of ease begins to color the delivery. Nothing more beneficial can happen to a young preacher than the call to preach the same discourse a number of times in succession, each time to a different audience. Repetition will make him a master of the train of ideas, improving his phraseology, and deeping the stream of thought. Who has not watched with delight the improvement in the presentation of a lecture heard from the same lips half a dozen times in succession? The change for the better was due to the deepening, straightening, and improvement of the channel in which the stream of thought seems to flow.

Writing.

If a student several times each month during a college course writes out and fixes a line of argument for a debate, he can acquire the power to fix and retain the thoughts as fast as he writes. The habit of memorizing the words is, of course, pernicious, because it is apt to make him the slave of his manuscript, to destroy his freedom in meeting the blows of an antagonist, and to divest him of the glow of feeling and anima-

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tion which gives force to the delivery while the mind is engaged in the elaboration of the argument. The sequence of ideas rather than of words should be fixed in the mind, very much as the student of Euclid fixes in his mind, not the words, but the ideas which constitute the chain of proof. This kind of practice gives a young speaker the sense of security without destroying his freedom in modifying the line of thought while standing upon his feet.

From this point of view the folly of much criticism in teaching is very apparent. The current of thought is frequently interrupted by drawing attention at the wrong time to mistakes in grammar and errors of pronunciation. The proper time for such criticism is after the movement of thought has reached the goal; and even then the critic should not call attention to too many defects at one time; otherwise the effect will be to discourage and bewilder the pupil.

Criticism.

The stream of thought is the most essential thing in writing, speaking, and oral reading. The management of face and hands and feet, the postures of the body, and the vocal utterance should, of course, not be neglected. The intelligent counsel of a good friend is needed to point out mannerisms and eccentricities. The practice prescribed by a wise teacher is helpful in pruning the delivery of defects and harmful habits which are sure to grow where attention to the thought sinks the delivery into the subconscious realm. Nevertheless, the main thing in writing and speaking is the stream of thought. A profound truth was stated by the Kentucky backwoodsman, who said that he would have it in him to become as great an orator as Henry Clay, were it not that he found himself lacking in two things: Whenever a favorable opportunity for a great speech presented itself he never knew *what to say* nor *how*

The thought.

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to say it. The *how* is more easily acquired than the *what*. Both should receive attention, from the kindergarten to the university. The getting of something to say is invention. It is the one thing in which special teachers and special courses give least help. The power of invention is acquired by years of effort and discipline. Tributaries from many sources must pour into the stream of thought before it becomes full, copious, and capable of carrying great thoughts, or of supplying the motive power for great undertakings.

In writing nothing should be allowed to interfere with the stream of thought. Some can write in the midst of noise. Others must seek silence and solitude. Gifted men like Horace Greeley can write in the cars, upon the knee, anywhere. Habit has much to do with the art of composing. In any event, the stream of thought must be kept flowing. In so far as the rules of grammar, logic, rhetoric have become unconscious guiding principles, they do not interfere with the evolution of thought. In so far as they absorb the attention and hinder the flow of thought, they should be cast to the winds during the first glow of writing. Better think of these during the process of rewriting, polishing, and correcting.

Hinderances.

So great a thinker and successful a writer as Charles Darwin makes the following suggestive statement concerning his own methods of composing:

"There seems to be a sort of fatality in my mind, leading me to put at first my statement or proposition in a wrong or awkward form. Formerly I used to think about my sentences before writing them down; but for several years I have found that it saves time to scribble in a vile hand whole pages as quickly as I possibly can, contracting half the words; and then correct deliberately. Sentences thus scribbled

How Darwin composed.

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down are often better ones than I could have written deliberately." *

No one should speak as he writes, nor should any one write as he speaks. Few men are satisfied with the stenographic report of a speech, exactly true to the language at the time of delivery. A reporter who cannot make a speech read better, without changing the line of thought, than if it were printed exactly as spoken is not a master of the art of reporting. Written discourse abounds in longer sentences, in more involved constructions, in forms of diction which please the eye, but are too cumbersome for the voice and the ear. The public speaker is prone to use short, simple sentences in which the subject of the sentence does not pass out of the mind before the predicate is reached. His style abounds in questions which arrest the attention of the hearer; if necessary, he indulges in colloquial expressions to which the ears of the hearer are accustomed, thereby bringing himself nearer the common people.

Upon a speech delivered in the British Parliament high praise was bestowed in the hearing of Mr. Fox. "Does it read well?" he inquired. "Yes, grandly," was the reply. "Then," said he, "it was not a good speech." It may be difficult to point out exactly wherein speaking differs from writing so far as the stream of thought is concerned; yet one feels the difference. Austin Phelps shows the difference by using an extract from an essay on the "End of God in Creation:"

Fox's opinion.

Written discourse.

"What was the final cause of creation? The transition from the unconditioned to the conditioned is incomprehensible by the human faculties. What that transition is, and how it could take place, and how it became an

* "Autobiography," page 80.

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actualized occurrence, it is confessed on all hands are absolutely incomprehensible enigmas. We cannot reasonably imagine, then, that, if we are thus ignorant of the nature and mode of this stupendous fact, we can nevertheless comprehend its primitive ground, can explore its ultimate reasons, can define its final motive. Nor can we think to unveil the infinite soul at that moment when, according to our conceptions, the eternal uniformity was interrupted and a new mode of being, absolutely unintelligible to us, was first introduced. We cannot think to grasp all the views which were present to that soul, extending from the unbeginning past to the unending future, and to fathom all its purposes, and to analyze all its motives. If anywhere, we must here repel everything like dogmatic interpretation of the phenomena, and admit whatever is put forth only as conjectural in its nature, or, at all events, partial, and belonging far more to the surface than to the interior of the subject."

One can easily see how ill adapted to oral delivery these sentences are. Phelps throws the same leading thoughts and succession of thoughts into a form adapted for public speaking:

Example of spoken discourse.

"Why did God create the universe? Creation is incomprehensible to man. What is creation? How was it possible? How did it ever come to be? I cannot answer. Can you? Every man of common sense confesses his ignorance here. But if we are ignorant of what creation is, and how it is, can we imagine that we understand why it is? Shall we think to unveil the mind of God in the stupendous act? That moment when God said 'Let there be light' was a moment of which we can know nothing but that 'there was light.' Shall we think to see all that God saw? Can we look through the past without beginning, and the future with-

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out end, and fathom all His purposes and all His motives? Can we, by searching, find out God? If we must repel assertion anywhere, we must do so here. Whatever we may think, it is but little more than guess-work. At the best it can be but knowing in part. The most we can know must be on the surface. It cannot penetrate to the heart of the matter." *

The plan of writing down a line of discussion helps to clarify the thought. Casting aside the manuscript as soon as the sequence of ideas is fixed in the mind emancipates the speaker from the written page. Several years of practice develop two kinds of style, one adapted for writing, the other for speaking. After this stage of development is reached, it may be no longer necessary to formulate on paper every line of argument. Nevertheless, the pen cannot be laid aside entirely without detriment to the quality of the thought and the effectiveness of oral discourse.

Two kinds of style.

Everything calculated to interfere with the stream of thought should, so far as possible, be eliminated from the act of composing. Some men find the pen an irksome drain upon their energy and vitality. Their thought moves faster than they can write. The employment of a stenographer aids them in the work of composing. The danger against which they must guard is a growing dislike to the use of the pen, and a deterioration of their style resulting in the obliteration of the difference which distinguishes effective speaking from successful writing.

Dictating.

There is a radical difference between a lecture and an oration. Public speaking which partakes of the nature of the lecture, aiming primarily at instruction or the communication of knowledge, may be assisted by ex-

* "Men and Books," pages 221, 222.

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periments, by maps, charts, and pictures upon the screen, by specimens and models designed to throw light upon the theme under discussion. Public speaking which partakes of the nature of oratory, its aim being to move the will to action, is generally limited in the appliances it can utilize, and in the way it must appeal to the hearer. It must not exhaust the attention of the hearer by consuming his time in the establishment of principles, and in showing, by lengthy details, how results are obtained. Far better is it to cite authorities, to quote their language if necessary, and to make the application to the case in hand. In referring to recognized standards, like a dictionary, a treatise on law, or the Sacred Scriptures, it is always best to quote the exact words. This is also more appropriate on the written page than a reproduction of the thought in inferior forms of statement. In public speaking, however, the original statement may be too involved, and a breaking up into shorter, simpler sentences may aid the forward movement of the stream of thought. The first aim of the speaker is to be understood. If he fails to reach the understanding, he can neither persuade nor convince, nor spur the will to action.

Lectures and orations.

There is another limitation to the kind of public speaking which partakes of the nature of oratory. The idea which the speaker seeks to have realized in the vote, or verdict, or conduct of others, must be carried back to the necessary ideas of the hearer. The full discussion of this peculiarity in the stream of thought belongs to treatises on rhetoric. Such a discussion can be found in Theremin's Rhetoric, translated by Shedd. Suffice it to say that the recognition of this principle makes the speaker a more thoughtful man. It causes him to rely for the effect he seeks to produce upon solid and sterling qualities rather than showy rhetoric. It tends to make

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the stream of thought flow deeper, fuller, yet clearer and with more power. Any interference with the stream of thought while the speaker is before the audience may be disastrous. The crying of a child, or an outburst of feeling in the audience, or some other mishap may disconcert his mind. Legouvé tells how the world-renowned advocate, Berryer, lost a very good cause by unconsciously starting his speech in too high a key. "His temples soon felt the unusual fatigue of the larynx; from the temples it passed to the brain; the strain being too great, the brain gave way; the thought became confused, and the language disarranged and indistinct." He broke down in open court because he never thought of descending from the lofty perch on which his voice started at the beginning of his plea. Legouvé claims, and the experience of many speakers confirms the claim, that the abuse of the high notes has not infrequently affected injuriously the orator's very flow of thought.

Starting in too high a key.

Three generals made stump speeches on a joint trip during the last Presidential campaign. One day the name of the candidate of the other great political party was mentioned, when there was a perfect storm of applause in the gallery. A second reference elicited similar applause, and the disconcerted general, who had bravely faced the enemy on the battle-field, took his seat. The next general, walking on a crutch, came forward, and requested that all who had been sent to disturb the meeting should rise. No one moved. He exclaimed, "There are some cowards here." Then he asked that all who had come to listen and learn should rise. Everybody rose. He exclaimed, "There are some liars here." Next he announced that any one attempting to disturb the meeting would be pitched out of doors, the general on the crutch declaring he would lead the attack.

The three generals.

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Soon a man arose as if to ask a question. Whereupon a big burly policeman threw the fellow out, and there was no further outside interference with the stream of thought in the mind of speaker or listeners. The man on the platform always has the advantage over disturbers in the audience, provided he is master of his faculties, full of resources, and quick at repartee.

The schools of France have been quoted to show the uselessness of exercises in oral reading. As in other things, so in school matters, distance lends enchantment to the view. Legouvé, in his lectures on the "Art of Reading," mentions with approval that in the great Republic of North America reading aloud is justly considered one of the very first elements of a child's education, whilst in France, reading aloud does not reach even the sorry dignity of a diverting art, but is regarded as a curiosity, a luxury, often something hardly better than a pretension.* This was written several decades ago, and may not be just to the French nation at this time. The value of oral reading depends upon the way in which it is done. If it amounts to no more than calling words and parrot-like imitation of the teacher's manner of reading, the exercise is a waste of time. The mastery of the new words and of the thought embodied should precede the attempt to read a lesson aloud. The mastery of the words involves ability to recognize them at sight, to pronounce them with fluency and ease, and to spell them by letter and by sound. It implies both a knowledge of their meaning and ability to use them in a sen-

The schools of France.

The reading lesson.

* "In the name, then, of a sound condition of mind and body, and in the confident hope of obtaining both for France, I call on our people to imitate the people of the United States of North America by making the art of reading aloud the very corner-stone of public education."—Legouvé's "Art of Reading," page 145.

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tence. An average series of readers has a vocabulary of five thousand words. The meaning of all these words may be known at sight, but ability to use them by tongue or pen is quite another thing, the vocabulary of most persons being not much in excess of a thousand words. The thought can be mastered by an exercise in silent reading, followed by the oral and written reproduction of the lesson. The mastery of the thought is a condition of proper vocal utterance.

Acting and reading.

There is a difference between acting and reading. The actor endeavors to speak and act after the exact manner of the character whom he impersonates. The reader aims to suggest the thought instead of imitating the original actors. An actor will go through the motion of stabbing or shooting an enemy; the reader simply aims to suggest the thought of what was done. Exercises in breathing, gesture, tone, pitch, cadence, voice may be needed for the sake of correcting defects; nevertheless, everything connected with oral reading should turn on and culminate in the stream of thought. If anything else is made the object of chief regard, the main purpose of oral reading is lost. It furnishes an excellent test by means of which the teacher can determine whether the pupil understands what he reads or is merely calling words after the manner of a parrot. To correct the unnatural tones acquired in the school-room, the pupil is wisely exhorted to read as he would talk.

Reading and talking.

In the effort to develop a style of reading exactly like talking, some teachers ruin their natural way of talking and reading. In conversation, they talk as if they were trying to read. While reading, they seem to be trying to talk. The human voice is so made that it puts the quotation marks to selections recited from memory and to sentences read from a manuscript or book. As a rule, a person can

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read best what he himself has written; yet his voice tells whether his sentences and thoughts are framed and evolved at the moment of delivery, or taken from a manuscript prepared beforehand. As a matter of fact, no one can read as he talks or speaks. A blindfolded listener could tell when Spurgeon was reading or speaking. The same was true of Charles Sumner, and of every other great speaker America has produced.

To think the best thoughts of the best men is the privilege of him who can read. To plant these thoughts in other minds by reading aloud is a noble achievement. To give in speech something from our own resources that others shall treasure is nobler still, because it links our life with the creative workers of the world. But noblest of all is it to write what shall be read by our own and future generations, in our own and other lands, as a source of light and life, of uplift and enjoyment. The worst punishment that can befall a human being is to be cut off from participation in the movement of the race towards greater well-being and perfection. One naturally desires to employ his gifts and powers for the benefit of mankind. The stream of thought determines what we shall accomplish. If others are to be benefited by our thinking, they must think our thoughts. The stream of our thought must carry ideas of interest and value to them, ideas they will care to get and keep. If our thinking is busy with things of transient interest, transient will be our influence over others. If our thought is to abide, it must deal with verities of eternal moment to humanity, with the works of Him who made the heavens and the earth, with the truth of Him who is "the same yesterday, to-day, and forever."

Abiding thoughts.

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XVI

KINDS OF THINKING

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"What we want is not the example of Democritus, who put out his eyes that, ceasing to read, he might think the more; or the example of Pythagoras, who devoted his evenings to solemn reflections on the events of the day. We want men and women of all-round activities who will set apart an hour for thought's own sake, and thus fulfil the exhortation of a wise man whose practice it was to 'sort his thoughts and label them.'"

T. S. KNOWLSON.

"People read a great deal more than they used to do,—there is more to be read,—but they think less. The chief danger of to-day is that of intellectual apathy. Life is so complex, the struggle for existence is so keen, and pleasures of various kinds so cheap and abundant, that men and women seem to live entirely on the surface of things. What we need is a call to independent thought."

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XVI

KINDS OF THINKING

As was pointed out in the first chapter, the word *thinking* has several meanings. One can hardly write or speak on education without using the word in more senses than one, and it is not always convenient to break the line of thought or discussion by indicating with a definition the meaning intended. This is a violation of Pascal's rule, that no terms in the least obscure or equivocal shall be used without defining them. Pascal possessed one of the most remarkable intellects the world has ever known. His style has been described as a garment of light. Few thinkers have attained, to an equal degree, clearness of expression and perfect grasp of the truth. Nowhere are these qualities more essential than in lectures and treatises on teaching. It is a misfortune that so useful a word as *thinking* should ever be ambiguous. The use of equivocal terms leads to misunderstandings in theory and faults in practice. The advantage of technical terms lies in the fact that after they have been clearly defined they can always be used in the same sense. The disadvantage in the use of technical terms is that they convey no meaning to minds unfamiliar with the terminology of the specific science to which they belong. Hence the best thinkers cannot escape the necessity of employing words in current use to convey their thoughts. As soon as words pass into common parlance they acquire a variety of meanings and of shades of meaning. The

Equivocal terms.

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thought of a people is always more or less in advance of their vocabulary; the same word must be used in several meanings, because no other term equally simple and convenient can serve as a substitute. No one, for instance, can write or speak in the English language without using the word *is* in both its figurative and its literal sense. The connection must show what signification is intended.

The term *thinking*.

The same remark applies to the word *thinking*. The connection must show whether it is used in the colloquial sense of guessing, or in the logical sense of a comparison of two ideas through their relation to a third, or in the broader sense of imaging, reflecting, and reacting upon what one reads or hears, or in a still broader sense, to designate any form of mental activity. Since the popular mind employs the word as a general term to cover the entire intellectual life, it is convenient to specify

Kinds of thinking.

kinds of thinking by the use of adjectives like independent, loose, continuous, organic, technical, scientific, and other qualifying phrases. Inasmuch as these distinctions are made for the purpose of characterizing differences observed in the thought-processes of the maturer life for which our pupils are to be trained, it is helpful to glance at them for the purpose of seeing the bearing of what we do at school upon habits of thought beyond the school.

What is meant by an independent thinker? Evidently one who is not indebted to others for the inferences

The independent thinker.

which he draws or the conclusions at which he arrives. Many practices at school are subversive of habits of independent thinking. The assignment of lessons of such length and difficulty that the weaker pupils must rely upon their stronger classmates for help, or resort to "coaches, keys, and ponies" for assistance, makes them helpless instead of self-reliant, and cultivates the memory at the expense of the under-

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standing. The lessons should be graded so as to beget the sense of mastery.. Every difficulty that is overcome by a pupil's own efforts tends to develop in him an ambition to conquer other difficulties. Few, if any, joys can be compared with the ecstatic joy of victory. Moreover, it should be the aim of the teacher to beget in the pupil a love of truth more potent and profound than reverence for a favorite authority. On the contrary, the feeling of independence and the desire of distinction by differing from other people may grow into a passion. This seldom does much harm in the case of an editor or a professor. If you give either of them leave to criticise and to print, he is well satisfied. If he is elected to a board of managers or the national assembly, his critical faculty and his fondness for finding fault and thinking differently from other people may make him a hinderance to the leaders, who must get things done, or cause him to stand apart, like Ewald, in the German Reichstag, as a one-man party, whose views must be ignored on all questions requiring prompt action or immediate decision. To counteract this tendency in a youth of strong personality, it is difficult to devise anything better than the moulding supremacy of class-spirit, the chastening influence of a a contest in the literary society, and the relentless lessons which a boy gets on the play-ground when he will not play because the game does not go his way. Independence of thought in the quest of truth, on the one hand, and concert of action for the public good, on the other, are two of the most useful lessons to be learned at school. At this point there is room for a kind of child-study apart from a syllabus of set questions, and leading to results which cannot be tabulated in statistics or averages. The average in such cases is untrue as a guide, and may be utterly subversive of correct habits of thinking, or the correct method of dealing with the individual. To

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give enough optional or specific work for the brightest, and not too much general or required work for the slowest, is an ideal hard to realize in the assignment of work, and yet of supreme importance in the endeavor to develop habits of independent thinking.

Independent thinking and popular government.

There is great need for independent thinking under a system of popular government, especially on the part of those who exercise the elective franchise. In the modern caucus or convention one man often does the thinking for the rest. "If he is the man whom I follow, I call him my leader. If he is the man whom you follow, I call him your boss." When the leader or boss is not sufficiently sure of his ability to bind the others by his orders, those who have a following are invited to a conference, at which a line of action is agreed upon to relieve the multitudes of the trouble of thinking. A delegate who was giving very vociferous vent to his feelings was rebuked by a colleague, saying, "Just think where you are." He replied with more emphasis than elegance, "I was not brought here to think, but to shout." Independent thinking is as hard work as the average man cares to do. He craves a guide, an authority to relieve him of the trouble of thinking for himself. Outside of their particular vocation or profession it is absolutely necessary at times for the strongest intellects to accept the conclusions of other thinkers. The man who has been successful at making money, and who finds that his thinking in financial matters is trustworthy, often makes himself obnoxious by assuming that his opinions and conclusions should be accorded equal weight in every other sphere of human activity. There is no better place to teach the individual his limitations without destroying his independence as a thinker than the atmosphere of a great university.

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The dependent thinker is aptly described by a writer in *Leisure Hours* in the following language:

"It is sometimes amusing to hear a man of this order coming out strongly with opinions which he would have you believe are thoroughly independent and original, but which you can trace directly to the source from which he got them. You could indicate those sources if it were not uncivil to do so, very much as a shrewd but not very well-behaved old gentleman is said to have indicated at church, in a tone sufficiently loud to be heard by the clergyman and the congregation, too,—which was especially galling,—the authors to whom the said clergyman had been indebted for his sermon, 'That's Sherlock; that's Tillotson; that's Jeremy Taylor.' 'I tell you what, fellow, if you don't hold your tongue, I'll have you turned out of church.' 'That's his own.'"

The dependent thinker.

The men who must depend upon others to do their thinking for them deserve pity and commiseration. The bureaus which thrive by furnishing essays and orations for commencements, sermons for special occasions, and even for the regularly recurring Sunday services, show how often our schools make their pupils dependent instead of self-reliant. On being cast upon the sea of life, their minds resemble a craft which has lost its rudder; they drift with wind and tide, uncertain where they shall land. Their thinking is not grounded on first principles; hence their minds reflect transient views on every question. The strong personality in the sunlight of whose influence they happened last to bask moulds their opinions and directs their intellectual life until they move into the sphere of new influences, constantly resembling those whom Randolph of Roanoke stigmatized as dough-faces because their votes were under the control of party leaders and were cast regardless of their convictions of right.

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The men whom the world reveres as great thinkers have been distinguished by their ability to give continuous thought to whatever engaged their serious attention. Newton claimed that he made his discoveries by always thinking about them. His biographers relate how he would for hours remain seated upon his bed, half dressed, absorbed in thought, forgetful of his surroundings. Stories of the absent-mindedness of Socrates, Sydney Smith, Neander, Edison, and many others who attained eminence as philosophers, authors, or inventors, are interesting indeed, but they throw no light upon the way in which these men acquired their marvellous powers; they merely show a capacity for focussing all the energies of the soul upon one point to the exclusion of sense impressions from without. It is very certain that men who excel in any line of work acquire habits of concentrated and continuous thought in one direction. Very different from these are the mental habits of the boy and the average man. A writer in *Cornhill Magazine* describes their intellectual activity as follows:

Continuous thought.

"The normal mental locomotion of even well-educated men and women (save under the spur of exceptional stimulus) is neither the flight of an eagle in the sky, nor the trot of a horse upon the road, but may better be compared to the lounge of a truant school-boy in a shady lane, now dawdling passively, now taking a hop-skip-jump, now stopping to pick blackberries, and now turning to right or left to catch a butterfly, climb a tree, or make dick-duck-drake on a pond; going nowhere in particular, and only once in a mile or so proceeding six steps in an orderly and philosophical manner."

The thoughts of some men resemble mosaic work. Each part is beautiful in itself. but has no inner connec-

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tion with those next to it. Men of this class are called loose thinkers; it is always difficult to retain what they say. The thinking of a totally opposite class of men resembles the growth of an organism. They start from a germinal idea, which, like seed sown into good soil, begins to grow, throwing out parts which have inward connection and which together constitute an organic unity. In a machine any part can be replaced by another. In the organism no such substitution is possible. For each organ bears a life relation to the whole, and if it is wanting the unity of the organism is destroyed. Organic thinking gives the hearer the feeling that the several parts and inferences of a discourse are evolved from his inner consciousness. Having had the germ-idea in his mind, he feels as if he had held all it involves; the speaker supplied the conditions of development as the sun supplies warmth for vegetable growth. The effect of such thinking is irresistible. The branches of study which thus grow out of a fundamental idea, and show the inner relation between the subjects not as a mere sequence, but as a living organic relation, have an educative value which cannot be too highly prized. The organic thinker, if he makes himself understood, has the audience on his side; and his cogency can seldom be refuted except by showing either that his germinal idea is wrong or that his conclusions have no connection with his premises.

Loose thinkers.

Organic thinking.

Dr. Harris has drawn attention to three stages of thinking. He claims that in the first stage things are regarded as the essential elements of all being, that in the second the mind discovers relations, —truly essential relations,—and that in the third stage the mind thinks the self-related. "Self-relation is the category of the reason, just as relativity is the category of the understanding, or non-relativity

Harris on stages of thinking.

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(atomism) the category of sense-perception." Theoretically this distinction is important as giving us a rational basis for the knowledge of God as revealed to man. Practically, every child thinks the idea of God. Where the study of science or philosophy leads to atheism, the wish is always father to the thought.

Technical and scientific thinking.

Clifford has made a distinction between technical and scientific thinking. The former enables one to do with skill and accuracy what has been done heretofore. The latter partakes of the nature of prophecy or prediction. He claims that scientific as well as merely technical thought make use of experience to direct human action, but that while technical thought or skill enables a man to deal with the same circumstances he has met before, scientific thought enables him to deal with circumstances different from any he has met before. In his opinion, scientific thought is human progress itself. An example or two can best be given in his own language.

"If you make a dot on a piece of paper, and then hold a piece of Iceland spar over it, you will see not one dot, but two. A mineralogist, by measuring the angles of a crystal, can tell you whether or not it possesses this property without looking through it. He requires no scientific thought to do that. But Sir Rowan Hamilton, the late Astronomer Royal of Ireland, knowing these facts, and also the explanation of them which Fresnel had given, thought about the subject, and predicted that by looking through certain crystals in a particular direction we should see not two dots, but a continuous circle. Mr. Lloyd made the experiment and saw the circle, a result which had never been even suspected. This has always been considered one of the most signal instances of scientific thought in the domain of physics. It is most distinctly an application of experience gained

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under certain circumstances." *

Clifford compares two well-known achievements in the domain of astronomy which help to set the distinction between technical and scientific thought in a still clearer light:

"Ancient astronomers observed that the relative motions of the sun and moon recurred all over again in the same order every nineteen years. They were thus enabled to predict the time at which eclipses would take place. A calculator at one of our great observatories can do a great deal more than this. Like them, he makes use of past experience to predict the future; but he knows of a great number of other cycles besides the one of nineteen years, and takes account of all of them; and he can tell about the solar eclipse of six years hence, exactly when it will be visible, and how much of the sun's surface will be covered at each place, and to a second at what time of the day it will begin and finish there. This prediction involves technical skill of the highest order, but it does not involve scientific thought, as any astronomer will tell you. By such calculations the place of the planet Uranus at different times of the year had been predicted and set down. The predictions were not fulfilled. Then arose Adams, and from the errors in the prediction he calculated the place of an entirely new planet that had never yet been suspected; and you all know how the new planet was actually found in that place. Now this prediction does involve scientific thought, as any one who has studied it will tell you. Here, then, are two cases of thought about the same subject, both predicting events by the application

* Clifford's "Essays," page 88.

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of previous experience, yet we say one is technical and the other scientific." *

The foregoing distinction may be valuable in the training of university students whose career is to be that of original research and discovery, but it has very little value for teachers in schools of lower grade. For ordinary purposes, science is the knowledge of things in their causes and relations. If the teacher begets the habit of asking why, and makes the pupils dissatisfied with simply knowing the how and the what, he has gone far towards making them thinkers in the scientific sense of the word.

Science as knowledge of things in their causes and relations.

How shall the knowledge of things in their causes and relations be attained? The mind first thinks things as isolated units apart from and without reference to other things. Under the impulse to know it resolves the thing into its elements or constituent parts, and then puts them together in a more complete idea of each thing as a whole. The boy whose curiosity impels him to take apart a watch or clock is following the bent of the mind to proceed analytically. If he does not try to put the pieces together, so that the reconstructed whole will keep time as before,

* Clifford's "Essays," page 87. Thus the movements of Sirius led astronomers (Peters and Auwers) to infer the existence of a satellite, which was subsequently discovered by Alvan Clark & Son through the eighteen-inch glass which they were completing for the Chicago Observatory. Similarly, Professor Wright, of Oberlin, carefully studied the Trenton deposits and their relations to the terrace and gravel deposits to the westward, and predicted that similar paleolithic implements would be found in Ohio. Two years afterwards Dr. Mertz found, eight feet below the surface, a true paleolith of black flint at Madisonville, in the Little Miami Valley. Other instances of scientific prediction will occur to the reader.

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he needs stimulus in the direction of synthetic thinking. Soon his interest in time-pieces leads him to detect similarities between American watches and those made in Switzerland, and he learns to classify time-pieces, to see a multitude of details and peculiarities at a glance, one characteristic or peculiarity bringing to his mind the distinctive parts and construction of every watch in a given class. From the way in which a given watch keeps time, he draws inferences in regard to the entire class. This is inductive thinking. From the conclusions he has framed, he makes up his mind as to the new watch which the jeweller offers him for sale. He is now thinking deductively.

From thinking things as units, the mind passes to thinking the relations of things. The adaptation of means to ends in play, in ministering to bodily wants, occupies the mind in very early stages of thinking. The gifts of the kindergarten appeal to this tendency in the mind, and help to develop it into habit and faculty. Design and its execution, means and end, the tool and its use, the raw material and the purpose for which it is to be used, thought-material and the essay in which it is to be formulated,—these are so many ways of thinking things or ideas in their relations. Not only may a relation become a distinct object of thought, but relations between relations, classes of relations,—for instance, in simple and compound proportion,—can thus be made to stand apart before the mind as distinct objects of thought. The most important of all these relations is that of cause and effect. How things come to be, their origin and development, the forces that make them what they are, are the questions of profound and abiding interest to the scientific mind. Laws are often spoken of as if they were causes. A law is a generalized statement of an invariable sequence of things or motions of things. We some-

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times personify these sequences, and speak of them as if they were forces in nature. The laws are personified, as if they were conscious beings demanding obedience, and inflicting punishment for disobedience. The consciousness of the personification is lost, and then along with spelling nature with a capital letter, we fall into the mistake of making laws stand for the Maker and Creator of all things. Furthermore, it is very important to distinguish the ground of knowledge from causes that are operative in the world outside of mind. The rain of last night caused the streets to be muddy; but the condition of the streets, an effect of rainfall, may be the ground of our knowledge that it must have rained last night. The fact that the earth is flattened at the poles, or, in other words, that its curvature is less at the poles than at the equator, explains the fact that degrees of latitude get longer as we approach the poles. The former is the cause, the latter is an effect. But the mind drew the former as an inference from the determination of degrees of latitude by actual measurement. The effect became the ground of knowledge. Frequently the cause is known or inferred from its effect. That which is causal in the world of mind is effect in the world outside of mind; and that which is effect in nature becomes the ground of knowledge in the processes of thought. From this point as vantage-ground, we spy the land in which thinking becomes knowing.

Distinction between laws and causes.

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XVII

THINKING AND KNOWING

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When a man's knowledge is not in order, the more of it he has the greater will be his confusion of thought. When the facts are not organized into faculty, the greater the mass of them the more will the mind stagger along under its burden, hampered instead of helped by its acquisitions.

H. SPENCER.

That knowledge cannot be gained without more or less of correct and prolonged thinking is a practical maxim which no one would be found to dispute. But that there is much knowledge which does not come by *mere* thinking is a maxim scarcely more to be held in doubt. Thinking is, then, universally recognized as an important and even necessary part of knowing; but it is not the whole of knowing. Or, in other words, one must make use of one's faculties of thought as an indispensable means to cognition; but there are other means which must also be employed, since it is not by thought alone that the human mind attains cognition.

LADD'S "PHILOSOPHY OF KNOWLEDGE," page 130.

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XVII

THINKING AND KNOWING

ONE morning a teacher was awakened by a noise, the like of which he had never heard and hopes never to hear again. It was unlike anything in his former experience. Soon he began to distinguish the hissing of steam and the moaning of men, but the cause was still a mystery. Later, he learned that the blast furnace in the neighborhood had exploded, and that several men were killed and others had been seriously injured by the explosion.

The cause of the noise could not be inferred, because there was nothing in his former experience with which it could be compared. The escaping steam and the voices of the suffering workmen were recognized because they could be interpreted in the light of what he had seen and heard before. In order that any one may derive definite knowledge from sense-impressions, there must be something in past experience to give meaning to the new experience.

Interpretation of sense-impressions.

Observation that issues in knowing is coupled with a process of thought in which the new perception is linked to the ideas which the mind brings to the perception. In other words, observation always involves the element of thinking; without thinking, sense-impressions cannot give us knowledge.

Knowing is impossible without thinking, and yet not all thinking gives rise to knowing. What is the relation between the two?

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Knowledge has been defined as firm belief in what is true on sufficient ground. The explanation of this definition which Locke gives is well known to every student of philosophy. "If any one is in *doubt* respecting one of Euclid's demonstrations, he cannot be said to *know* the proposition proved by it; if again he is fully *convinced* of anything that is not true, he is mistaken in supposing himself to know it; lastly, if two persons are each *fully confident*, one that the moon is inhabited, and the other that it is not (though one of these opinions must be true), neither of them could properly be said to *know* the truth, since he cannot have sufficient *proof* of it." *

What is knowledge?

The foregoing definition consists of three parts,—1, firm belief; 2, in what is true; 3, on sufficient ground.

Belief.

In common parlance, belief is distinguished from knowledge, the latter implying a higher degree of assurance than the former. In some treatises on psychology belief denotes all forms of assent, including the highest possible certainty and conviction. The expression *firm belief* excludes the element of doubt from knowledge.

Truth.

Truth, according to the etymology of the word, signifies that which the mind trows or believes to be fact or reality. It has its source in God, whilst knowledge proceeds from man. To be true, a proposition must be in exact accordance with what is or has been or shall be. Truth exists apart from the cognitions of the human mind. It would continue to exist if the mind of man were blotted out of existence, and there was truth long before the intelligence of man was called into being. The aim of thinking is to find out and lay hold of the truth. Thinking in which truth and error

* "Essay on the Human Understanding," Book IV., Chapter I.

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are mixed may have value as partial knowledge and as a stepping-stone to fuller knowledge. Knowledge becomes full and complete only in so far as it contains the truth, the whole truth, and nothing but the truth.

Full knowledge implies a basis upon which it may rest. There may be sufficient ground for the firm belief which constitutes the essence of knowledge even when the truth cognized is incapable of full and complete demonstration. The ground of knowledge.

It is natural for a child to believe. The statements of others are accepted as true without question, so long as the child has not been deceived by others. Hence many teachers have assumed that their chief function is to ask the reason *why*, so that belief in what is true may be based upon sufficient ground, and that nothing shall be accepted as true until it is proved. The reason why. This was one of the erroneous views under which Pestalozzi labored. He justified the undue attention paid to mathematics in his school on the ground that he wished his pupils to believe nothing which cannot be demonstrated as clearly as two and two make four. Whereupon Père Girard replied, "In that case, if I had thirty sons I would not intrust one of them to you; for it would be impossible for you to demonstrate to him, as you can that two and two make four, that I am his father and that I have a right to his obedience." *

The progress of a pupil may be hindered by too much emphasis upon the ground of knowledge. The human mind cannot make an exhaustive study of very many things. Exhaustive study. Exhaustion is a term applied by logicians to a method of proof in which "all the arguments tending to an opposite conclusion are brought for-

* Compayre's "History of Pedagogy," page 437, American translation.

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ward, discussed, and proved untenable or absurd, thus leaving the original proposition established by the exclusion of every alternate." Speaking positively, we may say that exhaustive study of a subject explores it in all its bearings and relations as well as in its nature and essence. In every subject the known is bounded by the unknown; new methods of preparation and investigation constantly reveal novelties in whole classes of objects which it was supposed had been studied exhaustively. The specialist seeks to know all that has been brought to light in his field of research, and to push out the limits of knowledge beyond the goal reached by his predecessors. The thoroughness of the specialist is not required in elementary instruction. The writer knows of a teacher who for an entire term kept a class of boys at work upon highest common factor and least common multiple on the plea that they did not thoroughly understand these subjects. No better plan of disgusting boys with arithmetic and algebra could have been devised. Thorough knowledge of these two subjects involves reasoning and demonstrations more difficult to grasp than half the theorems in Euclid. Instead of aiming at exhaustive treatment, the true teacher is satisfied with knowledge adequate for the subsequent work of the course. If the pupil has reached the stage where he can appreciate the reason why, it may be (though it is not always) wise to raise this question, and to insist on a comprehension of the proof. Very often the mind has enough to do in trying to see *how;* the question *why* then interferes with the mastery of the mechanical operations. Let any adult take up a system of arithmetic with which he is unfamiliar, say the arithmetic based on counting by fives, or by twelves, or by thirties (each of the last two, mathematically speaking, better than the arithmetic based on tens), he will soon find it is work enough at

The question how.

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first for his intellect to perform the operations of adding, subtracting, multiplying, and dividing without reference to the philosophic explanations which exhaustive study would require at every step in the operations.

Descartes applied several of the technical terms of optics to the science of mind, and in this he has been followed by Locke, Leibnitz, and others. An object seen at a great distance or in insufficient light looks obscure; as the eye approaches, or as the dawn increases, the object, as a whole, becomes clear enough to be distinguished from other objects, although its constituent parts are still confused. Increasing light or a nearer approach finally enables us to discern the parts, and the vision of the object grows distinct. Clear vision occurs where the object, as a whole, can be recognized; distinct vision occurs when the parts of the object seen can be recognized. In like manner ideas are said to be clear as distinguished from obscure, when they are discerned in outline; they are distinct (opposed to indistinct or confused) when they are discerned in their elements or constituent parts. Distinct mental vision requires analytic and synthetic thinking.

When knowledge is clear, when distinct.

Of many objects the mind needs only clear knowledge for ordinary purposes. One may distinguish two brothers by the total impression of each which he carries in his mind, and yet be totally unable to tell any specific marks by which he knows the one from the other. The painter, on the other hand, cannot be satisfied with this total impression; he studies the individual features until he has a distinct impression of their likenesses and differences.

Of the map of one's own country it pays to know the States and Territorial divisions. Of one's State, a knowledge of the counties, and of one's county, a knowledge of the townships may be helpful. For specific vocations more minute knowledge may be desirable. Each indi-

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vidual mind can well afford to stop with a measure of geographical knowledge that is adequate for the duties of his vocation and the purposes of his reading of books and newspapers.

Very little of our knowledge of geography is based upon experience; most of it rests upon testimony. The eye at a glance may take in the outlines of an island of the Susquehanna river. The fact that Great Britain is an island rests upon the testimony of maps; our belief is based upon what we have always heard and read, and is further strengthened by the absence of testimony to the contrary. If the fact had ever been questioned, the mind might hold its judgment in suspense until sufficient ground was found to warrant a conclusion.

When the knowledge which a pupil has is to be deepened or made more distinct a series of well-chosen questions may beget the required thinking. For instance, let us take the case of a pupil who has reached the stage where his knowledge of the properties of the parts of speech should be made more complete. Let the teacher ask for the difference between a pencil and a part of speech, between a noun and a name, between gender and sex, between number in grammar and number in arithmetic, between person in grammar and a person like the President of the United States, between case in grammar and a case in division of fractions, between tense and time, between mode and manner, between action and a verb, between the object of an action and the object of a verb. Comparison will soon show the inaccuracy of the statement that the direct object of an action is in the accusative case; and the learner will see that case is a property of nouns, not of objects, and cannot be predicated of the object of an action, but of the *word* which *denotes* the object of the action, which word may be either in the nominative or the accusative case as the

Value of questions.

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verb is either in the passive or active voice. Comparison will lead the pupil to see clearly that gender is a property of nouns, whereas sex or the absence of sex is predicated of that for which nouns stand. Comparison will serve to bring out the distinction between number in grammar as a property of nouns indicating one or more than one, and numbers in arithmetic, of which there are as many as there are units or collections of units in the universe. Thinking by comparison will lead to the detection of similarities and differences, to discrimination, combination, and generalization, and through these to more distinct and more adequate knowledge.

Questions which draw attention to likenesses and differences, to causal relations and logical sequences, stimulate analysis and comparison; the resulting judgments clarify the stream of thought and push the boundary of knowledge into the regions of the hitherto unknown.

Theory, true and false.

The greatest minds when working under the influence of a false theory fail to arrive at truth. Socrates rejected the view of Anaxagoras that the sun is a fire, because we can look at a fire, but not at the sun, because plants grow by sunshine and are killed by fire, and because a stone heated in fire is not luminous, but soon cools, whereas the sun always remains equally hot and luminous. Newton did more than all other thinkers combined to make astronomy a science; his discoveries in physics and mathematics rank him among the greatest investigators the world has thus far known; yet he spent many nights trying to find the method by which the baser metals could be transmuted into silver and gold; his researches as an alchemist led to nothing, because he was working under the spell of a false theory.*

* "There can be no doubt that Newton was an alchemist, and that he often labored night and day at alchemical experiments. But in trying to discover the secret by which gross metals might be

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Faraday acknowledged that he was often compelled to give up his preconceived notions, and in some cases his failures are almost as instructive as his discoveries. It was characteristic of him to hold to his theories until he proved them either true or false, and he was ever ready to reject any hypothesis as soon as he found it inconsistent with the laws of nature. Newton was willing to suspend judgment for years upon his theory of gravitation, until more accurate measurements of the earth's size and the moon's distance showed his theory and calculations to be right. Socrates advised his followers to quit the study of astronomy, probably because he felt that in his time the data were not sufficient to warrant definite conclusions. Hosts of instances can be cited showing that the thinking of the strongest intellects does not issue in knowing when it is based upon or biassed by a wrong working hypothesis. And yet it must be confessed that wrong hypotheses may lead to valuable negative results, as in the case of Kepler's investigations, each exploded theory making room for the construction of a theory more in accordance with the facts. The superiority of men of genius lies in their love of truth and fidelity to fact; in the facility with which they construct theories to account for observed phenomena; in the patience with which they test theory by fact, and in the readiness with which they reject

Scientists.

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rendered noble his lofty powers of deductive investigation were wholly useless. Deprived of all guiding clues, his experiments were like those of all the alchemists, purely haphazard and tentative. While his hypothetical and deductive investigations have given us a true system of the universe, and opened the way for almost all the great branches of natural philosophy, the whole results of his tentative experiments are comprehended in a few happy guesses, given in his celebrated 'Queries.'"—Jevons's "Principles of Science," pages 505, 506.

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every hypothesis as soon as it is found to be in irreconcilable conflict with well-established facts. The average life of a theory in science is said to be only ten years. The average would be lower still if all rejected theories had been put into books. The men possessed of a truly scientific spirit differ from ordinary men not only in the painstaking accuracy of their observations and in the surprising fertility with which they frame theories, but also in the habit of verifying every hypothesis until there is sufficient ground to establish its truth and to receive it as an addition to the sum total of human knowledge.

The common people are quite as ready to frame theories as the scientists and philosophers. It would be well if they were equally patient in testing their theories and in verifying their suppositions. The human mind cannot help generalizing. The moment a child uses a common noun it begins to classify. Its tendency to pull things to pieces and to put them together again are exhibitions of the mind's tendency to treat everything by analysis and synthesis. Purpose and design, cause and effect early show themselves in the thinking of children. The teacher need but guide these activities and give the mind the proper material to work upon; the result cannot be doubtful if the mind which plays upon the learner's mind has been trained to operate according to the laws of thought and the principles which must guide in the discovery of the truth.

The common people.

Doubt is sometimes the prerequisite of knowledge. To raise a doubt in the mind of a growing youth may cause him to think. It may cause him to explore the grounds of his knowledge, to ascertain the rational basis upon which his beliefs rest, and to reject such as were of the nature of prejudice or of tradition with no sufficient warrant for acceptance. Rational belief is far superior to blind faith.

Doubt.

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When the doubt is raised in regard to the verities of one's religious faith there is grave danger of landing in scepticism or infidelity. What is truth? may be asked in the spirit of Pilate, who turned away from the Great Teacher with a despairing sneer and without waiting for a reply. Pilate had trifled with his own conscience until he could no longer discern truth and righteousness. Some men need better hearts in order that they may think and know the highest truth. The hope can be held out that whenever the truth is earnestly sought by the human heart the soul will ultimately be guided into a knowledge of the truth. To disturb the grounds upon which rest the principles of morality and religion is a dangerous experiment, especially in the case of immature minds. The flood of doubt may sweep away the solid foundations of a pupil's moral nature and leave him a wreck upon the quicksands of vice or upon the rock of scepticism.

It is the nature of the child to believe, to cherish faith in what others tell him and in what the world presents to his vision. To disturb the fervor and strength of this trust before the understanding is ripe for fuller knowledge may result in life-long injury. The child's faith in fairyland, in Santa-Claus, should, of course, be kept from becoming a source of terror. The stories of ghosts, spooks, and hobgoblins sometimes employed in the nursery to influence conduct may cause fears, terrors, and horrors from which it is well to emancipate the child as speedily as possible through the light of clearer knowledge.

Better than doubt as a stimulus to thought is the desire to know. St. Augustine was on *fire to know*. The teacher who kindles and keeps burning this fire in the soul of the pupil has supplied the most powerful incentive to thought; for without thinking knowledge is impossible of attainment.

The desire to know.

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As we may start our wood flaming by coals hot from another's fire, so we may kindle a burning desire for knowledge by bringing the mind in contact with minds that are all aglow with the desire to know. A burning fire may soon exhaust its fuel if left to itself. The teacher supplies the fuel, fans the flame, directs its activity for well-defined purposes. Here the analogy breaks. Instead of smoke and ashes we want living products as the result of knowing. As thinking leads to knowing, so knowing should give rise to further thinking. Nowhere is the teacher's function of guiding more indispensably necessary than in the interplay of these two activities. While the learner is engrossed in the pursuit of knowledge, the teacher is watching the process and the results. He is not satisfied unless the activity of thinking and knowing ends in full cognition. It has been well said that a dog knows his master, but does not cognize him; that to cognize means to refer a perception to an object by means of a conception. The objects of thought must be sorted and arranged in groups; the particular notion must take its place in the general concept; the materials upon which the mind acts must be assimilated and organized into a unity, showing how each has its origin and how it stands in living relation to every other part of the organic whole; otherwise thinking cannot lead to complete cognition.

Full cognition.

The incident at the beginning of this chapter shows that some preparation is necessary to interpret sense-impressions and organize the materials of thought for the purpose of cognition. The degree of preparation determines how far the instruction at a given time shall aim to go. To get a clearer idea of the thing to be known may exhaust the learner's strength. If so, the presentation should stop at that point. But as soon as his power and interest are equal

The limit of instruction.

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to the task he should be led to analyze the object of thought so as to cognize the constituent elements, the essential attributes, a process whereby he will arrive at distinct knowledge. It may be advisable before dropping the inquiry to institute comparisons between objects of the same class, for the purpose of calling attention to differences and likenesses and evolving general concepts or universal propositions. For many thinkers these are the goal of thinking. If they can resolve the universe to a few simple generalizations, their minds are satisfied. Nothing more barren can well be imagined or conceived.

Application of knowledge.

Cognition is not complete until the knowledge has been or can be applied. At times there may be a division of labor and glory in the discovery and application of truth. The discoveries of Professor Henry which made the electric telegraph possible involved thinking quite as valuable as the invention of Professor Morse. The achievement of Cyrus W. Field in laying the Atlantic cable involved thinking quite as important as the researches and experiments of Lord Kelvin which made the cable successful. Interesting examples of such division of labor in thinking cannot justify neglect of the applications after a general truth has been evolved and stated.

The instruction may sometimes begin with a statement of applications, in order to prepare the mind for the thinking that issues in knowing. The applications of color in the railway service, in navigation, and in the arts will create an interest in the study of color without which the presentation of the fundamental ideas may be in vain. Several lecturers have admitted that they failed, in the presentation of color lessons, to hold the attention of their pupil-teachers until they excited an interest in color by indicating important applications. This statement of applications by way of preparation

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must, however, not be confounded with the applications which should follow the framing of general propositions and the cognition of general truths.

The hypotheses of the scientist correspond to the general truths and principles which instruction always aims to reach. In all except the most advanced investigations, the pupil should work under the guidance of principles that have risen above the hypothetical stage. He should think under the inspiration of well-established truths. He should master the known in his chosen field before he seeks to enlarge the boundaries of human knowledge by invasions into the realm of the unknown. Sad is the spectacle of a talented mind wasting its strength in fruitless efforts to rediscover what is already well established.

The formulation of truths in mathematical studies is sometimes carried to extremes. The pupil may at times be allowed to work under the guidance of principles which he knows by implication, and which he has never had occasion to formulate in explicit statements. The formulation of the principles of algebra can be carried into the statement of hundreds of general propositions. If the pupil is asked to fix all these in the crystallized or specific form given in the text-book, it may result in a prodigious waste of time. Furthermore, the effort to follow invariably any formal steps in the order of instruction is apt to make the instruction unduly formal and lifeless. No thinker can afford to think in the set forms of the syllogism while evolving a train of thought. Conscious conformity to these hinders progress in the spontaneous evolution of germinal ideas. In like manner, although the student of pedagogy may find a guide in the rules and principles of his science while preparing the subject-matter of a lesson, yet, in giving the instruction, the truth must be the object of chief regard, the centre of attention in con-

The formulation of truths.

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sciousness. Constant thought of prescribed steps makes the teaching stiff and formal, and dissipates the joyous interest which accompanies free and spontaneous thinking. Formal rules are very often like hobbles on the feet of the horse. They impede his speed, rob him of half his power and energy, and spoil his enjoyment of the open field. Bearing this in mind, the young teacher will perhaps not be harmed by the advice that in his teaching he should ever seek to lead the learner to clear and distinct perception of likenesses and differences in the subject-matter of each and every lesson. The newer methods of teaching a beginner to read, wisely draw attention to the points of similarity and difference in the shapes and sounds of the letters of the alphabet. They even go to the extreme of comparing sounds with the noises of animals, with which the child in the larger cities is totally unfamiliar. This error is not half so bad as the opposite extreme. Very much of the bad teaching by which the schools are afflicted arises from the assumption that the learner sees the points of agreement and difference which are so very obvious to the mature mind of the teacher. The consequence is mental confusion and loss of the joy of definite thinking. The detection of likeness in objects having many points of diversity gives the mind an agreeable surprise. This emotion is an element in the pleasure afforded by the various forms of wit, metaphor, and allegory. Professor Bain has shown how greatly progress in science and art is indebted to the discovery of similarity in the midst of great diversity. * Much of the child's progress in knowledge must be ascribed to the same principle. Children notice points of similarity that often escape older persons. On seeing the

Similarity in diversity.

* "The Senses and the Intellect," pages 488–524.

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picture of a tiger, they call it a cat. A mother who showed her little daughter, just beginning to talk, the caricature of a man prominent in the public eye, was surprised to hear the child exclaim, "Papa." It was the child's word for man, as she afterwards discovered. Where she saw contrast, the child only noticed the points of similarity between one man and another. As the power of discrimination advances, the mind pays more attention to points of difference than to points of likeness. Indistinguishableness gives way to clear and distinct knowledge. With the further growth of intelligence the mind seeks the hidden resemblances in objects far removed from one another in space and time, or by surface appearances. At first sight the bat seems like a bird, because it can fly. Scientific discrimination assigns it to the class of mammals. The identification of the lightning in the clouds with the sparks of the electric machine gave Franklin world-wide reputation as a philosopher. The identification of the force which causes bodies to fall to the earth with the force which holds the moon in its orbit, and with the kind of force by which the sun attracts the bodies of the solar system, has been justly called the greatest example of the power to detect likeness in the midst of diversity. The power of detecting similarity in diversity should be appealed to whenever it is helpful either for purposes of illustration or discovery. Algebra is shorn of half its difficulty as soon as the learner is led to see that the operations in multiplication, division, involution and evolution of monomials turn on signs, coefficients, and exponents. Let him grasp the thought that the words add, subtract, multiply, and divide respectively express the law of exponents in the four operations above named; and he will not only escape the perplexities of the average student in the more difficult operations of ordinary algebra, but

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he will also see at a glance the beautiful truth which underlies the manipulation of logarithms.

The thinking that ripens into knowing.

Thinking that ripens in knowing involves comparison, discrimination, and formation of judgments. Through the detection of likeness and unlikeness in objects and their relations, judgments are formed, inferences are made, and conclusions are drawn, which mark the transition from thinking to knowing. Discrimination, identification, judgment, reasoning, definition, division, and classification mark the stages through which the mind passes in thinking things, their relations, more especially their causes, effects, laws, and ends. Analysis and synthesis, induction and deduction, are the processes by which the intellect explores the content and extent of concepts, and passes to general principles and truths, and to their applications in thought and action. As processes of mental activity, these are discussed in detail by the psychologist. The laws of thought to which they must conform in order to be correct are set forth in treatises on logic. It would be a mistake to under-estimate the value of a knowledge of logic and psychology; but neither of them can supply the place and function of the living teacher. He who would learn to think in some special line of research should go to a master of that specialty, learn of him what is well established in the chosen field of study, imbibe his methods of work, think his thoughts, catch his spirit, and follow his advice until the hour for independent investigation comes. Great is the tonic effect of a university atmosphere; but greater still is the bracing influence of the atmosphere created by a specialist who is both a master in his department and a master in the art of teaching. The choice of a teacher is of more account than the choice of a university, either at home or abroad.

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Thinking is not the whole of knowing. Feeling and willing play an important part in thinking and knowing. Words like heretic, sceptic, and sophist have a history which shows the distrust of mankind in pure intellectual effort. It would be hard to find a better commentary on the effect of a perverse heart upon the operations of the intellect than the following paragraph from Max Müller, although it was penned for a purpose entirely different from the use here made of it.

Knowing involves more than mere thinking.

"No title could have been more honorable at first than was that of Sophistes. It was applied to the greatest thinkers, such as Socrates and Plato; nay, it was not considered irreverent to apply it to the Creator of the Universe. Afterwards it sank in value because applied to one who cared neither for truth nor for wisdom, but only for victory, till to be called a sophist became almost an insult. Again, what name could have been more creditable in its original acceptation than that of sceptic? It meant thoughtful, reflective, and was a name given to philosophers who carefully looked at all the bearings of a case before they ventured to pronounce a positive opinion. And now a sceptic is almost a term of reproach, very much like heretic,—a word which likewise began by conveying what was most honorable, a power to choose between right and wrong, till it was stamped with the meaning of choosing from sheer perversity what the majority holds to be wrong." *

There are realms in which thought cannot beget knowledge of the truth until there is a radical change in the wishes and desires of the heart, in the choice and aims of the will, in the movings of the inmost depths of the soul.

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* Max Müller's "Science of Thought," page 605.

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XVIII

THINKING AND FEELING

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There is much contention among men whether thought or feeling is the better; but feeling is the bow and thought the arrow; and every good archer must have both. Alone, one is as helpless as the other. The head gives artillery; the heart, powder. The one aims, and the other fires.

BEECHER.

It may be noted that medical men, who are a scientific class, and, therefore, more than commonly aware of the great importance of disinterestedness in intellectual action, never trust their own judgment when they feel the approach of disease. They know that it is difficult for a man, however learned in medicine, to arrive at accurate conclusions about the state of a human body that concerns him so nearly as his own, even though the person who suffers has the advantage of actually experiencing the morbid sensations.

HAMERTON.

When pupils are encouraged to make for themselves fresh combinations of things already known, additional progress is certain. Variety of exercise in this way is as attractive to children as many of their games. If, when such exercises are given, the rivalry involved in taking places were discontinued, and all extraneous excitement avoided, the play of intelligence would bring an ample reward. I plead for discontinuance of rivalry in such exercises, because, while it stimulates some, in other cases it hinders and even stops the action of intelligence. If any teacher doubts this, he may subject a class to experiment by watching the faces of the pupils, and next by asking from the child who has been corrected an explanation of the reason for the correction. Hurry in such things is an injury, and so is all commingling of antagonistic motives. All fear hinders intellectual action, and the fear of wounded ambition offers no exception to the rule. The fear of being punished is more seriously detrimental than any other form of fear which can be stirred. It is essentially antagonistic to the action of intelligence. Let mind have free play.

CALDERWOOD.

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XVIII

THINKING AND FEELING

In all our thinking it is very important to get a clear and full vision of the thing to be known. This is not always as easy as it seems. Like Nelson in the battle of Copenhagen, we may consciously turn the blind eye towards what we do not like and exclaim, "I do not see it." The lenses through which we gaze may be green, or smoked, or ill-adjusted, and thus without suspecting it we may see things in false colors or distorted shapes. Our bodily condition may color everything we see and think. In health and high animal spirits every thought is rose-colored. In periods of disease and depression everything we think seems to pass, "like a great bruise, through yellow, green, blue, purple, to black. A liver complaint causes the universe to be shrouded in gray; and the gout covers it with inky pall, and makes us think our best friends little better than fiends in disguise."

Bodily conditions.

One of the greatest hinderances to correct thinking is prejudice. Hence all who have presumed to give advice on the conduct of the understanding have had something to say concerning prejudice. Bacon has a chapter on the idols of the mind, and Locke contends that we should never be in love with any opinion. In a charming little volume on the "Art of Thinking," Knowlson has a chapter in which he enumerates and discusses the prejudices arising from birth, nationality, temperament, theory, and unintelligent conservatism. The list might easily be enlarged. Close analysis must con-

Prejudice.

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vince any one that feeling strengthens all forms of prejudice, and there are very few, if any, fields of thought in which it is not essential for the attainment of truth to divest ourselves of preconceived notions and the resultant feelings, and to weigh the arguments on both sides of a question before reaching a conclusion.

A student may take up geometry with a feeling of prejudice for or against the study, based upon what he has heard from others concerning its difficulties or the teacher who gives the instruction; but after he has mastered the demonstration of a theorem he does not lie awake at night wishing the opposite were true. In the realms of mathematics the wishes of the heart are not in conflict with the conclusions of the intellect. In the domain of ethical, social, historical, or religious truth the head often says one thing and the heart another. "We see plainly enough what we ought to think or do, but we feel an irresistible inclination to think or do something else." In most of the instances in which the study of science has led to agnosticism the wish was father to the thought. When two men argue the same question, weighing the same arguments and reaching opposite conclusions, as did Stonewall Jackson and his father-in-law at the outbreak of the Civil War, the inclinations and wishes of the heart must have influenced their thinking.

The wishes of the heart and the conclusions of the intellect.

Feeling is an element in all forms of mental activity. The intellect never acts without stirring the emotions. The teacher who reproved a pupil for showing signs of pleasure and delight over the reasoning of Euclid, saying, "Euclid knows no emotion," must have been a novice in the art of introspection. Who cannot recall the thrill of delight with which he first finished the proof of the Pythagorean proposition? Mathematics is considered difficult; the emotions

Feeling an element in all mental activity.

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connected with victory and mastery sustain the student as he advances from conquest to conquest. The effort which some thinkers make to reduce the phenomena of the universe to a few universal principles is, without doubt, sustained and stimulated by a feeling that there must be unity in the midst of the most manifold diversity.

Scientists and philosophers are prone to imagine themselves free from the prejudices which warp the thinking of the common mind. Descartes started to divest himself of all preconceived notions; yet he could not divest himself of the notion that he was immensely superior to other men. "This French philosopher regarded himself as almost infallible, and had a scorn of all his contemporaries. He praised Harvey, but says he only learned a single point from him; Galileo was only good in music, and here he attributed to him the elder Galileo's work; Pascal and Campanella are pooh-poohed. Here is an instance of how pride in one's own work may beget a cheap cynicism with regard to the work of others; and how as a feeling it blinds the mind to excellences outside those we have agreed to call our own." Of men in general Jevons, in his treatise on the "Physical Sciences," * says,— Descartes.

"It is difficult to find persons who can with perfect fairness register facts for and against their own peculiar views. Among uncultivated observers, the tendency to remark favorable and to forget unfavorable events is so great that no reliance can be placed upon their supposed observations. Thus arises the enduring fallacy that the changes of the weather coincide in some way with the changes of the moon, although exact and impartial registers give no countenance to the fact. The whole race of

* Page 402.

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prophets and quacks live on the overwhelming effect of one success compared with hundreds of failures which are unmentioned or forgotten. As Bacon says, 'Men mark when they hit, and never mark when they miss.' And we should do well to bear in mind the ancient story, quoted by Bacon, of one who in Pagan times was shown a temple with a picture of all the persons who had been saved from shipwreck after paying their vows. When asked whether he did not now acknowledge the power of the gods, 'Ay,' he answered; 'but where are they painted that were drowned after their vows?' "

Sometimes the feeling that a given way of looking at things is undoubtedly correct prevents the mind from thinking at all. A lady claimed that she had been taught to accept the statements of the Bible in their literal sense, and that in this belief she was going to live and die. She was asked to read the twenty-third Psalm. At the end of the first verse she was asked whether she could be anything else than a sheep if the Lord was literally her Shepherd. When, a little farther on, she was asked in what green pastures she had been lying down, she burst into tears. Her condition, and that of hundreds of thousands of others, is correctly given in the opening pages of J. S. Mill's "Subjection of Women." *

J. S. Mill on the influence of feeling upon thinking.

"So long as an opinion is strongly rooted in the feelings, it gains rather than loses in stability by having a preponderating weight of argument against it. For if it were accepted as the result of argument, the refutation of the argument might shake the solidity of the conviction; but when it rests solely on feeling, the worse it fares in argumentative contest the more persuaded its adherents are that

* Page 6.

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their feeling must have some deeper ground which the arguments do not reach; and while the feeling remains, it is always throwing up fresh intrenchments of argument to fill any breach made in the old."

When a man's opinions are, as he thinks, grounded in first principles, it is but natural that he should be unwilling to abandon them without a struggle to intrench himself behind impregnable arguments. If he has reached his conclusions as the result of long and careful inquiry, he has a right to hold on to them with more than ordinary tenacity. The same regard for truth which led him to form an opinion should, however, make him willing to change whenever he finds himself in the wrong. He should avoid the frame of mind of the Scotch lady who, when it was charged that she was not open to conviction, exclaimed, "Not open to conviction! I scorn the imputation. But," added she, after a moment's pause, "show me the man who can convince me." The secret of this tenacity of opinion is not love of truth, but love of self,—in one word, pride.

Regard for truth.

In view of the hinderances which certain kinds or degrees of feeling throw into the way of thinking, it might be inferred that the thinker must suppress the element of feeling in his inner life. No greater mistake could be made. If the Creator endowed man with the power to think, to feel, and to will, these several activities of the mind are not designed to be in conflict, and so long as any one of them is not perverted or allowed to run to excess, it necessarily aids and strengthens the others in their normal functions. Whilst it is a duty to overcome prejudice, fear, embarrassment, anxiety, and other emotions or degrees of emotion which interfere with our ability to think correctly, especially when face to face with an audience or with our peers and superiors,

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it is equally a duty to cultivate the emotions which stimulate thinking and strengthen the will. Without the ability to feel strongly, it is impossible to stir the hearts of an audience. A strong character is impossible without strong emotion. Jesus could weep and denounce. He showed the strongest emotion in his public discourses and at all the great turning-points of his life. The men and women who have done most for the race showed the element of strong feeling in their thinking and in their efforts at philanthropy and reform. It is the feeling of patriotism that sustains the soldier on the field of battle and the statesman in the midst of public criticism and personal abuse. According to Plato, the feeling with which education begins is wonder. "The elementary school," says Dr. Brumbaugh, "does its best work when it creates a desire to learn, not when it satisfies the learner." Teachers everywhere are beginning to see that it is the mission of the elementary school to beget a desire for knowledge that will carry the pupil onward and upward, and not to make him feel satisfied with a mere knowledge of the rudiments, so that he will leave the school at the first opportunity to earn a penny.

Emotions are helpful.

Dr. Brumbaugh on the emotions.

Dr. Brumbaugh further says,—

"We must recognize the emotional life as the basis of appeal for all high acting and high thinking. We can never make men by ignoring an essential element in manliness. To live well, we must know clearly, feel keenly, and act nobly; and, indeed, we shall have noble action only as we have gladsome action,—action inspired of feeling, not of thought. The church made men of great power because it made men of great feeling."

The close connection between thinking and feeling cannot be ignored without serious detriment to the intellectual development of the pupil. Some teachers

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play upon the feelings in ways that prevent accurate and effective thinking. The tones of voice in which they speak, their manner of putting questions and administering discipline, their lack of self-control, and their frantic efforts to get and keep order cause the pupils to feel ill at ease and destroy the calmness of soul, which is the first condition of logical thinking. The skilful teacher calls into play feelings like joy, hope, patriotism, that stimulate and invigorate the whole intellectual life; he is extremely careful not to stir emotions like fear, anger, and hate, which hinder clear and vigorous thinking.

Playing upon the feelings.

Feeling plays an important part in the examinations by superintendents for the promotion of pupils, or by State boards whose function it is to license persons to teach or preach, to practise law, medicine, or dentistry, or to test the fitness of applicants for some branch of civil or military service. Examiners are often responsible for the failure of those whom they examine. If the first questions arouse the fear of failure, causing the mind to picture the disappointment and displeasure of parents and teachers and friends, and the other evils which result from a loss of class standing, the resulting emotions hinder effective thinking and thus prevent the pupil from doing justice to himself and his teachers. The expert seeks to lift those whom he examines above all feelings of embarrassment. With a friendly smile, a kind word, and a few easy questions he puts the mind at ease, dissipates the dread of failure, and gets results which are an agreeable surprise to all concerned. If he cannot otherwise make those before him work to the best advantage, he will even sacrifice his dignity by the use of a good-natured joke which turns the laugh upon himself or upon some other member of the board of examiners. Jokes at the expense

Responsibility for failure at examinations.

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of any one of those examined are a species of cruelty which cannot be too severely condemned, to say nothing of the effect upon the results of the examination.

Within certain limits thinking begets feeling, and feeling stimulates thinking. Beyond these limits each interferes with the other. When feeling rises to the height of passion it beclouds the judgment and prevents reflection. Certain kinds of speculative thinking leave the heart cold and ultimately destroy the better emotions and the warmer affections. "It is terrible," said the daughter of a voluminous writer on theology, "when a man feels a perpetual impulse to write. It makes him a stranger in his own house, and deprives wife and children of their husband and father." Abstract thinking may be indulged in to the exclusion of the tastes and emotions which help to make life worth living. The oft-quoted experience of Darwin is a case in point. In his autobiography he gives his experience, showing the effect of his exclusive devotion to scientific pursuits upon his ability to enjoy poetry, music, and pictures. "Up to the age of thirty and beyond it poetry of many kinds gave me great pleasure, and even as a schoolboy I took intense delight in Shakespeare, especially in the historical plays. I have also said that pictures formerly gave me considerable and music very great delight. But now for many years I cannot endure to read a line of poetry. I have tried lately to read Shakespeare, and found it so intolerably dull that it nauseated me. I have also almost lost my taste for pictures or music. Music generally sets me thinking too energetically on what I have been at work on, instead of giving me pleasure. . . . My mind seems to have become a kind of machine for grinding general laws out of large collections of facts; but why this should have caused the atrophy of that part of the brain alone, on which the

Speculative thinking.

Darwin's experience.

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higher tastes depend, I cannot conceive. . . . If I had to live my life again, I would have made a rule to read some poetry and listen to some music at least once a week; for perhaps the parts of my brain now atrophied would thus have been kept alive through use. The loss of these tastes is a loss of happiness, and may possibly be injurious to the intellect, and more probably to the moral character by enfeebling the emotional part of our nature." *

Every teacher has both felt and witnessed the effect of embarrassment upon ability to think. To face an audience of a thousand people was embarrassing to some excellent thinkers like Melanchthon and Washington. On the other hand, the sight of a multitude of listening, upturned faces stimulates natures and temperaments like that of Martin Luther and Patrick Henry, causing them to think more vigorously and to feel more deeply.

The sight of an audience.

Great thoughts spring from the heart. This is certainly true of thoughts which have lifted men to higher planes of effort. And it is true of the best thoughts and volitions which a pupil puts forth. The desire for knowledge may develop into the love of truth. The student is half made as soon as he seeks knowledge for its own sake and values the possession of truth above all other worldly possessions.

Great thoughts.

The Herbartians deserve praise for the attention they have given the doctrine of interest. The older text-books on psychology seldom refer to interest as an important element in the education of the child. The greatest boon which can come to a child is happiness, and this was impossible in the days when fear of the rod held sway in the school-room. Then children

Interest.

* Darwin's "Autobiography," page 81.

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looked forward to the school with feelings of dread; they went with fear and trembling. From the day that the children became interested in their lessons the rod was no longer required. Instead of crying because they must go to school, they now cry because they cannot go. Through interest the school becomes the place to which children best like to go.

A boy who was pronounced incorrigible, and who had been transferred from school to school because he could not get along with his teachers, at last met a teacher who discovered that he could take apart and put together watches and clocks. She allowed him to fix her clock, and thus won his heart. She asked him to explain to the school the mechanism of instruments for keeping time. His interest in clocks she connected with the numbers twelve and sixty, then with the time-table, with denominate numbers, and finally with the whole subject of arithmetic. Interest in the exercises of the school converted the incorrigible boy into an obedient and studious pupil.*

Interest in a clock.

There is no more important element of emotion for teachers to cultivate than that which enters into the feeling of interest. Interest sustains the power of thought, diminishes the need of effort in the direction of voluntary attention, and lies at the basis of all successful teaching, book-making, and public speaking. The teacher, the writer, the speaker who wearies us has lost his power over us. The lesson, the book, the sermon that interests us has found an entrance to our minds; the greater the interest the more potent and profound the influence upon the inner life.

The moment a teacher begins to lose interest in a subject, that moment he begins to lose his ability to teach

* For this incident the writer is indebted to Dr. A. E. Winship.

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that subject. From this point of view the recent graduate has a manifest advantage over the old pedagogue whose interest in the subjects of instruction has been dulled by frequent repetition. The latter can keep himself from reaching the dead-line by keeping up his studies in the allied departments of knowledge, and by watching the growth of mind and heart in his pupils,—a growth that always reveals something new and interesting by reason of the boundless possibilities that slumber in every human being. The interest in the growing mind is spontaneously transferred to the branches of knowledge which stimulate that growth, and, in ways that no one can explain, the interest which the teacher feels is communicated to the pupils whose minds are prepared to grasp his instruction.

Interest conditions ability to think.

By far the larger proportion of books taken from our free libraries are books of fiction,—books which appeal to our emotional life. It shows that even those who are habitual readers can be best reached through the emotions. Of course, the act of reading proves that their feelings are reached through the intellect; yet it cannot be denied that emotion is the element of their inner life which sustains the interest in the novel. Appeals to the intellect which do not touch the heart fail to reach the deepest depths of our being, and hence fail to stimulate in others the productive powers of the soul. Only thoughts which come from the heart can reach the heart. This is true of the child and the adult, of the reader and the listener, of the scientist and the man of affairs, of the author and the editor, of the orator and the philosopher, of the teacher, and, in short, of all whose duty it is to stimulate the thinking and to influence the conduct of their fellow-men.

Fiction.

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XIX

THINKING AND WILLING

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Strong reasons make strong actions.

SHAKESPEARE.

Bad thoughts quickly ripen into bad actions.

BISHOP PORTENS.

The man of thought strikes deepest, and strikes safely.

SAVAGE.

Reason is the director of man's will, discovering in action what is good; for the laws of well-doing are the dictates of right reason.

HOOKER.

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XIX

THINKING AND WILLING

MUCH thinking is spontaneous, in the sense that there is no conscious effort of the will to direct and control the activity of the mind. Under normal conditions the stream of thought flows onward, like the current of water in the bed of a river. When the onward movement is interrupted, an act of volition may be needed to bring the mind back to the regular channel. There are forms of intellectual activity called dreaming, reverie, and meditation, in which the ideas follow each other without any effort to regulate them. Often they are fanciful, incoherent, and illogical; they are suggested by passing objects, by musical sounds, perhaps by the stimulating influence of a drug or narcotic. Few can start a train of thought, winding up their minds as they would a clock, and then letting it run down until the discourse, lecture, or newspaper article is complete, no conscious effort of the will being required to keep the mind from wandering. This may be partly a gift of nature, but mostly it is the result of discipline.

What is discipline? We speak of mental discipline, of military discipline, of family discipline. What is the element which all these have in common? An army is under discipline when every soldier and every officer is subject to the will of his superior, so that the entire body of men can be moved against the foe at the will of the commanding general. A family is under discipline when the entire household

Discipline.

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is under the control of the head of the house. The school is under discipline when all the pupils are subject to the will of the teacher, and to the rules which he has laid down for the regulation of conduct. The mind is under discipline when its powers are under the control of the will, and its activities are in accord with the laws of thought. It is important to ascertain the laws of thought which underlie correct thinking. These are developed and discussed in treatises on logic, —a science that should be mastered not only by those who must meet others in the field of argument and controversy, but by all who seek to regulate the thinking of their own minds, or to aid others in the formation of correct habits of thought.

Mental discipline.

Fortunately, the law of habit here comes into play to lighten the conscious effort of the will. When the intellect, through the guidance of a conscious will, has acted according to the forms of thought in which the logician can find no fallacies, it tends to act again in that way, and the next time a less expenditure of conscious effort is required. The thinking of the teacher, if correct and logical, tends to beget correct and logical habits of thought on the part of the pupil. It is a piece of good fortune to fall under the dominating influence of a towering intellect. For a time the growing mind that is engaged in thinking the thoughts, and mastering the speculations, the reflections, the reasonings, of a master who is such not merely in name, but also in fact, may be in a subjection very like unto intellectual slavery. Sooner or later the day of emancipation arrives; and those who were not under the invigorating tuition of such an intellectual giant are surprised at the thought-power developed by the youth whose equal they hitherto fancied themselves to be.

Habit.

Those who expect to spend their days in teaching, lec-

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turing, preaching, pleading, or writing have great reason to strive after the discipline which results in placing all the powers of mind and heart under the control of the will. The feelings which interfere with reflection should be repressed and expelled by strenuous effort. The emotions which stimulate thinking should be cherished and fostered. The inner nexus, which binds ideas in logical trains of thought, should be followed until the habit becomes second nature. Volitional control.

Thinking which goes forward according to some established habit requires less effort than intellectual work that is accompanied with much volitional effort. This fact serves as a valuable indication to men who must do intellectual work for the press or the pulpit or the lecture-room. Perhaps no one is better qualified to speak on this point than Dr. Carpenter, who studied mental action from the physiological point of view, and whose publications show the quality, as well as the quantity, of his intellectual labor. He says,—

"To individuals of ordinary mental activity who have been trained in the habit of methodical and connected thinking, a very considerable amount of *work* is quite natural; and when such persons are in good bodily health, and the subject of their labor is congenial to them,—especially if it be one that has been chosen by themselves, as furnishing a centre of attraction around which their thoughts spontaneously tend to range themselves,—their intellectual operations require but little of the controlling or directing power of the will, and may be continued for long periods together without fatigue. But from the moment when an indisposition is experienced to keep the attention fixed upon the subject, and the thoughts wander from it unless coerced by the will, the mental activity loses its spontaneous or automatic character; and (as in the act of walking) more Dr. Carpenter.

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effort is required to maintain it volitionally during a brief period, and more fatigue is subsequently experienced from such exertion than would be involved in the continuance of an automatic operation through a period many times as long. Hence he has found it practically the greatest economy of mental labor to work vigorously when he feels disposed to do so, and to refrain from exertion, so far as possible, *when it is felt to be an exertion.* Of course, this rule is by no means universally applicable; for there are many individuals who would pass their whole time in listless inactivity if not actually spurred on by the feeling of necessity. But it holds good for those who are sufficiently attracted by objects of interest before them, or who have in their worldly position a sufficiently strong motive to exertion to make them feel that they *must* work; the question with them being, *how* they can attain their desired results with the least expenditure of mental effort." *

Jokes.

There is a danger to which public speakers are exposed, against which the efforts of a resolute will are not too potent. To capture a crowd that is more easily moved by jokes than by argument, the speaker resorts to sallies of wit and humor and turns the laugh upon an opponent. The temptation to cultivate one's gifts in this direction is very strong, and when yielded to, it destroys the powers of logical reflection and consecutive thought. Wit is illogical, because it introduces into the current of thought what is foreign to the subject in hand, the incongruity giving rise to the laughter. Wit and humor serve a useful purpose in acting as a safety-valve to let off the discontent which accumulates in the human breast, and may be used for that purpose with great effect. But they should never be allowed to

* "Mental Physiology," page 389.

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divert the stream of thought from its logical channel. The reputation for wit and humor may dispose people to laugh at everything a man says. It destroys their respect for his judgment and impairs his power to follow a line of thought to its legitimate conclusion. The ability to discuss a theme in all its bearings and details implies the power to investigate a subject in its essence and relations, to resolve an idea into its elements, and to present these in the form most easily understood,—an object which is as far from the purposes of the funny man as the poles are from the equator.

All thinking tends towards the expression of thought. "Every expression of thought," says Tracy, "whether it be word, or mark, or gesture, is the result of an active will, and as such may be classed among the movements." Word, mark, and gesture do not exhaust the list of movements by which the mind expresses thought. Every handicraft is a form of expressing thought quite as important as writing and speaking and gesticulating. The fine arts and the useful arts are so many ways through which the will passes into thinking and issues in the expression of thought. Movements for reform are the intense expressions of great thoughts which have their origin in the heart. The men who spend their lives in the atmosphere of colleges and universities are apt to be satisfied if they have expressed their thoughts in a lecture or on the printed page. They live in books, and their thinking terminates in books. The thinking which issues in getting things done, in deeds, actions, achievements, is undervalued and too often ignored. University men are waking up to this defect in their thinking. They are throwing themselves into movements for reform and giving the world splendid examples of the translation of thought into vigorous action. The effort to carry theory

Forms of thought-expression.

Thinking in action.

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into practice reacts powerfully upon the mind, forces the individual to see things as they are, and saves him from the habit of looking only for things which the schools have taught him to expect. When thinking issues in doing, the process promotes intellectual honesty. This remark is especially applicable to exercises in which the hand makes in wood, metal, marble, or clay what the mind has conceived. The execution cannot be accurate unless the thinking has been accurate and satisfactory. Drawing is a universal language. It imposes upon the mind a degree of accuracy which is wanting in the fleeting spoken word or even in the more permanent printed or written sentences.

The movements in manual training are an excellent preparation for the movements in the handicrafts and the daily occupations by which men gain the necessaries and the comforts of life. Ten thousand men are active in supplying our breakfast-table, and many thousand more in providing clothing, shelter, light, heat, and the manifold necessities and luxuries of modern society. All these involve thinking quite as useful, as logical, and as effective as the thinking which ends in talk or printer's ink. The relation of thinking to doing and the reflex influence which the latter exerts upon the former is seen in the solution of problems and in all exercises involving the application of knowledge. Manual training is really and primarily a training in thinking, but it is the kind of thinking most closely related to thinking in things, and its value in education is so great that it has led to the formulation of the maxim, We learn to do by doing,—a maxim which deserves separate consideration, because, as usually applied, it is taken to mean that doing by the hand necessarily and inevitably leads to thinking and knowing.

Thinking in business.

Another aspect of the relation of thinking to willing

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claims our attention. Thinking is an important element in the growth of the will. The education of the will is coming to be recognized as a matter of supreme importance. The development of character is everywhere emphasized. No teacher in these days regards intellectual training as the sole or chief aim of the school. The philosopher is no longer regarded as the highest type of humanity. The age demands that thought shall pass into volition, and that volition shall manifest itself in action. The executive is not satisfied with the investigation of a subject in its essence and relations, with the elaboration of thought into a system; he must get things done. Mere thinking he despises. The philosopher he regards as a man troubled with ideas, the poet as a man troubled with fancies and rhymes; he hates men who let their minds "go astray into regions not peopled with real things, animate or inanimate, even idealized, but with personified shadows created by the illusions of metaphysics or by the mere entanglement of words, and think these shadows the proper objects of the highest, the most transcendental philosophy." And the sympathies of the multitudes are on the side of the executive in his exaltation of the will as the chief element of utility and success.

Growth of the will.

The acts of the will should be guided by intelligence. The will is weak and vacillating if the ends to be accomplished are not clearly conceived, if the purposes to be accomplished are not definitely thought out. Thinking is the guide to willing. Thought gives direction to volition.

There are successive stages in the growth of the will as clearly defined as the activities of memory and imagination. In the first or lowest stage the aim is some form of happiness. In the second stage the will acts under the influence of some ethical idea, commonly finding expres-

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sion in a maxim like the command, Thou shalt not steal, or in some fixed occupation like a trade or farm work. In the third the will acts under the inspiration of the good or its opposite, and from motives grounded in right or wrong. In all these stages of growth thinking is a most important factor. Let us go into details for purposes of illustration. The human will in its process of development starts on a physical rather than a spiritual basis. On the one hand a want is felt and on the other an impulse towards the satisfaction of that want. In course of time this impulse or appetence assumes the form of intelligent or conscious purpose looking towards the gratification of felt wants, and then the will begins to show itself in the form of clear, definite volitions and actions. The strength of the will depends largely upon these impulses or appetences; and their strength in turn depends upon the health, the temperament, the organization (physical and psychical) of the individual. If by careful diet, exercise, or otherwise, we invigorate these, we thereby furnish capital that will in after years bear compound interest in the form of strong will-power. If the diet, exercise, play, sleep, and work are not properly regulated, first by the parent, the nurse, and the teacher, and later by the individual himself, the appetences develop into appetites that enslave the will and seriously interfere with its further growth. As the power to think is developed, the will passes over into a higher stage of activity. The very longing for happiness leads the child to impose restrictions upon itself. It feels happy if it can secure the approbation of those with whom it associates. If we show our displeasure at something it has done, the little philosopher begins to practise self-denial in certain directions for the purpose of regaining and retaining our good will. The second stage is now reached in which self-gratification gives place to self-

Self-gratification.

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denial, the will acting under the influence of one or more ethical ideas. The child at school is lifted upon this loftier plane by the circumstances which surround him; it must practise the school virtues, —punctuality, industry, obedience, and the like; it accepts certain forms of self-restraint in keeping quiet, in abstaining from play, in observing the rules of the school. Where the discipline is rigid and the instruction lacks interest, it may even conceive of the school as a mere place of self-denial and self-restraint. "Why do you come here?" asked a director. The little boy replied, "We come here to sit and wait for school to let out." The hours at school can be sweetened by exercises in thinking and expressing thought to such an extent that the school becomes the place to which children best like to go. Some full-grown men have not advanced very far beyond this second stage in the growth of the will. They follow some regular occupation as the boy does in going to school; they practise certain forms of virtue,—say honesty, so that you could intrust to them your pocket-book with perfect safety,—but they break the Sabbath, use God's name in vain, and commit daily many other sins and transgressions. Occasionally one finds a school in which no pupil would dare to be caught telling a lie, and yet the moral tone is low, there being vices which, like a cankerworm, eat out the moral life of the school. The teacher should not feel satisfied until he has raised the pupil to the third stage, where the will is brought under the inspiration of the good, and right becomes the law of life.

Self-denial.

The right.

Upon this highest plane different phases of development can be detected. The law of right may brandish the avenging rod of conscience and drive the individual into paths of rectitude. The idea of duty thus operating alone may reduce him to the subservience of a slave and

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prevent him from reaching the high stature of perfect human freedom. This kind of slavery is apt to be followed by a struggle in which the lower nature seeks to assert itself against the higher, and if the latter conquers, the person is apt to be elated with the feeling of victory. Whenever you hear a man boast of the sacrifices he has made in his devotion to duty, you can rest assured he has not yet reached that lofty elevation in will-culture upon which the person does right spontaneously and without effort, and never dreams of having made a sacrifice in the performance of the hardest duties.

Of course, the development from the first stage may move in the opposite direction. If the appetences are gratified beyond the requirements of self-preservation, or of the well-being of the child, they grow into uncontrollable desires and passions; the individual sinks deeper and deeper into selfishness. He may deny himself for the sake of some ambition, or vice, or wicked end which the soul cherishes; then, unless lifted up by the grace of God, he will ultimately land in a state bordering on that of Mephistopheles in Goethe's Faust, a character who found pleasure in human suffering, and whose will was constantly under the direction and inspiration of the principle of evil. He will at last become like Milton's Satan, who exclaimed, "Evil, be thou my good." College boys who delight in hazing innocent freshmen have gone far towards this loathsome stage of moral degradation, the lowest which the will can reach in its downward career.

Evil.

Now, it is easy to see the relation of thinking to these several stages of will-development. Volition presupposes something to be done, an end to be sought and accomplished. If the will is to act steadily in the endeavor to realize this end, the end must be clearly thought and held before the soul in definite

Thought and volition.

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form. To do the right implies that the right be known as the result of right thinking. A soul ignorant of right cannot be expected to practise the virtues which are grounded in the law of right. On the other hand, many forms of evil are never conceived by young people unless suggested to them by their superiors.

Volition issues in doing, and doing is a powerful stimulus to thinking. Making things out of wood, metal, marble, wax, papier-maché, or even out of paper is genuine thinking in things. It is a species of doing which flows from thinking through willing and reacts upon the process of thinking. To see how a thing is made is better than to be told how, but to make it by our own effort, skill, and thought is vastly more educative than seeing and hearing. Manual training tends to make the pupil intellectually honest. He cannot get away from a thought expressed in wood or other material as he can from a thought expressed in language which may suffice to suggest his idea, but not to give it adequate expression. This influence of doing upon thinking has led to the formulation of the maxim, We learn to do by doing,—a maxim whose limitations and legitimate meaning it will be necessary to discuss in a separate lecture.

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XX

THINKING AND DOING

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When we turn to modern pedagogics, we see how enormously the field of reactive conduct has been extended by the introduction of all those methods of concrete object-teaching which are the glory of our contemporary schools. Verbal reactions, useful as they are, are insufficient. The pupil's words may be right, but the concepts corresponding to them are often direfully wrong. In a modern school, therefore, they form only a small part of what the pupil is required to do. He must keep note-books, make drawings, plans, and maps, take measurements, enter the laboratory and perform experiments, consult authorities, and write essays. He must do, in his fashion, what is often laughed at by outsiders when it appears in prospectuses under the title of original work; but what is really the only possible training for the doing of original work thereafter. The most colossal improvement which recent years have seen in secondary education lies in the introduction of manual-training schools; not because they will give us a people more handy and practical for domestic life, and better skill in trades, but because they will give us citizens with an entirely different intellectual life. Laboratory work and shop work engender a habit of observation, a knowledge of the difference between accuracy and vagueness, and an insight into nature's complexity and into the inadequacy of all abstract verbal accounts of real phenomena, which once brought into the mind remain there as lifelong possessions. They confer precision; because, if you are *doing* a thing, you must do it definitely right or definitely wrong. They give honesty; for, when you express yourself by making things, and not by using words, it becomes impossible to dissimulate your vagueness or ignorance by ambiguity. They beget a habit of self-reliance; they keep the interest and attention always cheerfully engaged, and reduce the teacher's disciplinary function to a minimum.

WILLIAM JAMES.

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XX

THINKING AND DOING

THE best methods of instruction in the ordinary school aim at the expression of thought in language. If a thing has been well said, the teacher and the examiner are apt to make no further inquiries. Although the expression of thought in written or spoken language is a species of doing, there is often a wide chasm between getting a thing said and having it done. Many of the reforms and revolutions thought out by university professors never get beyond the room in which they lecture or the page on which they formulate their ideas. The freedom of speech in the universities never troubles a despotic government until the ideas of the professors and students show signs of passing into the life of the nation. The difference between speech and action, between the man of words and the man of deeds, has long been felt and emphasized. The favorite method of teaching by lectures, and requiring the pupil to take notes, fails utterly if it stops with mere telling how a thing is to be done, and is not followed by actual doing on the part of the learner. Work in the shop, in the field, and in the factory often proves more effective in fitting a boy to earn a living than the theoretical instruction of the schools. The advantage of doing over telling as a means of learning has led to the formulation of the maxim, "We learn to do by doing," and some educational reformers have announced the maxim as a principle of education universal in its application. Hence it is worth while to clarify its meaning and to

Saying and doing.

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ascertain its limitations. In so doing, we shall get a glimpse of the true relation between thinking and doing.

The maxim applied to medicine and surgery.

A young man possessed of unbounded faith in this maxim came to town for the purpose of practising medicine and surgery. He announced that if any person got sick he proposed to give them medicine in the hope of learning the physiological and therapeutic effects of the various drugs. If any limbs were to be amputated, he was willing to try his hand, in the hope of ultimately learning how to perform surgical operations. He was too simple to succeed as a quack. He did not get a single patient; the people wisely gave him no opportunity of learning to do by doing.

The maxim in the other professions.

Equally foolish were it thus to apply the maxim to any of the other professions. Would you, with life or property at stake, allow a novice to plead your cause at court in order that he might learn to plead by pleading? Who would waste the golden Sabbath hours in listening to one who was trying to learn to preach by preaching? The civilized world regards knowledge, which is the product of the act of learning, as the indispensable guide of those who offer their services at the bar, from the pulpit, or in the sick-room. When a Yale professor was asked whether study was required of those divinely called to preach, he replied that he had read of but one instance in which the Lord condescended to speak through the mouth of an ass.

Even an ass may learn to do some things by continually doing them in a blind way, and that, too, in spite of his proverbial stubbornness; but such learning by blind practice is unworthy of the school-life of a being gifted with human intelligence, and capable, it may be, of filling a profession. Instinct may guide a bee or a beaver; but knowledge should guide man in the arts

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and habits which he acquires. This fact is not ignored in the maxim as originally given by Comenius. "Things to be done should be learned by doing them. Mechanics understand this well: they do not give the apprentice a lecture upon their trade, but they will let him see how they, as masters, do; then they place the tool in his hands, teach him to use it and imitate them. Doing can be learned only by doing, writing by writing, painting by painting, and so on." There is in this statement a clear recognition, on the one hand, of the knowledge-getting which precedes and accompanies all intelligent doing, and, on the other, of the practice which is needful for the attainment of skill. The master mechanic seeks first to give his apprentice a clear concept of what is to be done; and the knowledge thus acquired through the eye, and perhaps partly through hearing directions and explanations, is afterwards put into practice by the actual manipulation of tools and materials. If the maxim had been allowed to stand in this, its original form and meaning, no one could have objected to its use and application. But when the attempt was made to elevate it into a principle of binding force for all teaching; when, furthermore, the form was shortened so as to widen the meaning, and the maxim was then applied to regulate the acquisition of every form of human activity, both physical and mental, it is not surprising that protests were heard, and the necessity was felt of investigating the maxim for the purpose of ascertaining its limitations and defining its meaning.

Comenius.

Yet we must not fail to make grateful acknowledgment of the services to education rendered by those who lifted the maxim into prominence. How often were pupils expected to learn one thing by doing another. Drawing was advocated because it would improve the penmanship. Silent reading or thought-

Value of the maxim.

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getting was to be learned by oral reading or thought-giving. The alphabet was taught as if the names of the letters would make the child familiar with the sounds. The idea of number was to be gotten by naming the numbers or imitating the Arabic notation. Facility and accuracy in the use of language were to be acquired from exercises in parsing and analysis. Familiarity with birds, flowers, minerals, chemicals, etc., was to be gained from the learned phraseology of the text-books. Sometimes even the teachers knew very little more than the technical terms. When the great ornithologist, Wilson, visited Princeton College, the professor of natural history scarcely knew a sparrow from a woodpecker. A great change has come over Princeton and all other higher institutions of learning; and the new influence has been felt in our high schools, and even in the grades below.

Whilst cheerfully acknowledging the value of the maxim of Comenius, we should, nevertheless, insist on the difference between a maxim which may regulate our conduct in specific cases and a principle which is an all-controlling guide in operations. Coleridge says, "A maxim is a conclusion upon observation of matters of fact, and is speculative; a principle has truth in itself, and is prospective." It is always dangerous to generalize upon facts observed in one realm of investigation, and then to allow others to apply these general statements to realms as diverse from the original field of observation as mind or spirit is from matter. The disciples in such cases always manifest the hidden weaknesses in the system of their master. They rush in where he would have feared to tread. They push his language to extremes, from which his deeper insight, broader vision, and larger experience would have caused him to shrink. Comenius framed the maxim from the observation of bodily acts; some seek to apply it to every

Maxims, principles.

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form of human activity. The original language has been twisted into a statement that sounds paradoxical. "We learn to do by doing." What can these words mean? If we *can* do a given thing, what need is there of learning to do that thing. If we cannot do the thing to be learned by the doing of it, how can any doing on our part issue in learning? Evidently the maxim in its modern form, if it is at all valid, must partake of the nature of a paradox, which, though seemingly absurd, is yet true in essence or fact. For the purpose of testing the validity of a paradoxical statement, there is no better way than to ascertain its possible meanings, to eliminate those evidently not intended, and finally to investigate the one or more senses or interpretations that may legitimately be put upon the language. The investigation will, in this instance, reveal the relation existing between doing and the act of learning.

Analysis of the maxim.

In the first place, the maxim cannot mean that we learn to do by every kind of doing. The kind of doing by which the young man hoped to learn medicine and surgery was ridiculed centuries ago; no one in our day would advocate mere blind doing as a means of learning. The maxim must refer to doing guided by an intelligent will. The doing must be guided by thinking that is based upon correct and reliable data or premises.

Again, the maxim cannot mean that we learn one thing by doing another. The maxim was emphasized in protest against the absurdity of some of our methods of teaching. It may happen that the learner accidentally discovers one thing while seeking to find out some other thing; to expect that this shall always be the case is to invite disappointment. For instance, pupils do not learn to spell while studying books if attention is absorbed in the meaning, and is not drawn, in separate exercises, to

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the correct orthography of words that are apt to be misspelled.

There is a third limitation to the maxim on the side of attention. How, for instance, is the art of writing acquired? It is undoubtedly true that a boy cannot learn to write without himself writing; it is equally true that he is not always learning or improving in penmanship while he is practising with his pen upon paper. From the teacher or the copy he gets a concept of the letters to be made. The first efforts at imitation are fraught with defects. The pupil must clearly recognize wherein he failed, and earnestly strive to remedy the defects, if the next attempt is to be an improvement. The maxim, if here applied, must mean that the pupil learns to do by continually doing, as nearly as he can, the thing to be done. With each step of progress, his concept of the form of the letters and how to make them becomes more accurate; or, in other words, his power and skill keep pace with his knowledge. Finally, after much practice, the nerves and muscles which control the act of writing are properly co-ordinated; the habit of writing with ease is acquired; the process becomes largely subconscious, if not altogether automatic. The learner has at length reached the stage in which his attention is no longer concentrated upon the form and beauty of the letters, but rather upon the thought to be expressed, and it is quite possible that henceforth his chirography will grow more illegible the more he writes. Of course, he is now learning the art of composing by composing; but he has ceased to learn in the direction of his handwriting by writing, because the attention is riveted upon something else. Even before the subconscious stage is reached, practice, if too long continued, may exhaust the powers of attention, and doing can no longer issue in learning by reason of fatigue.

Fatigue.

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On the score of attention there is a limit to the application of the maxim in another direction. Talking, oral reading, and public speaking may be spoiled by too much attention. Practice in these, under the guidance of an injudicious teacher, may serve to make the gestures too studied, the pronunciation too precise, and the tones of the voice too artificial, defects by which the hearer's mind is drawn from the thought to the delivery.

The lack of good elocutionary drill in youth is a serious misfortune, yet the writer cannot help blaming the elocutionists for ruining one public speaker among his acquaintances. Under their tuition the gestures and articulation of this friend have become almost faultless; but there is such a self-conscious air about his platform utterances that the audience can think of nothing except the delivery. By his efforts at doing he has learned most emphatically not to do. The same thing may happen in elementary instruction, and in the practice-schools connected with our State normal schools. Injudicious criticism by the teacher may so rivet the attention upon the utterance that the pupils lose sight of the thought to be expressed, and the more they practise under his guidance the worse their reading becomes. The vocal and physical elements, in the act of oral reading or speaking, should spring spontaneously out of the thought and sentiment to be conveyed. Any drill which interferes with this natural connection between the mental and the physical is indescribably bad, and should never be regarded as a means of learning. Equally severe must be the sentence of condemnation upon much of the criticism to which pupil teachers are subjected by their fellow-students and their critic-teachers at our normal schools, and upon the comments made by candidates for the ministry and their professors upon the efforts of the embryo preacher during

Injudicious criticism.

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the so-called homiletical exercises. Injudicious fault-finding leads to a kind of doing which cannot issue in learning.

Within these limitations we find a wide field for the application of the maxim to our efforts at learning to think and to express thought. The hand performs a very important function in aiding the mind to perfect its concepts. The metric system remains a dark, confused mass of names so long as the pupil does not actually handle and use the metric units of weights and measures. A few days of manual training, during which the learner is compelled to measure accurately, are of immense account in developing accurate ideas and accurate thinking. Of all the ways of expressing thought, those by the hand and the tongue are more perfect than those by the eye, the face, the gesture, the bodily movement. The latter are well adapted to express feeling; the former, to express thought. Few have ever thought of the marvellous mechanism given to a human being in the arm and hand. A glimpse from the mathematician's point of view is here very interesting. A pencil fastened to the end of a ruler revolving around a fixed point will describe a circle. If the pencil be fastened to the end of a second ruler revolving around the end of the first, while the first revolves around the original centre, the pencil will describe a very complicated curve. If three radii, revolving in this way, be joined together, the pencil at the end of the third can be made to describe the cycles and epicycles by which the ancient astronomers explained the movements of the planets. The modern mathematician has shown that, by annexing a fourth, a fifth, and a sixth radius, each revolving around the preceding, while the first is moving around the original centre, all curves of the fifth and sixth orders can be

Application.

The arm and hand.

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described. Let any one examine his right arm, starting from the shoulder and ending with the fingers, and he will find that since infancy he has had this mechanism for executing curves and movements, has been using this wonderful system of revolving radii to express thought, and that it has been to him a source of skill in thinking and doing. When viewed in their anatomical and physiological aspects, human arms and hands are seen to be a still more wonderful mechanism, rivalled only by the tongue in capability for describing any curve and uttering any kind of thought. Whilst the tongue may speak many oral languages, the hand writes them all, and supplies additional methods for expressing thought in drawing, painting, sculpture, instrumental music, in the various handicrafts, and in the machines which act like man's hand made bigger, more powerful, more tireless.

From this point of view one can see a wide field for the intelligent application of the maxim to our efforts at learning to write, to talk, to walk, to play on a musical instrument, or to handle the tools of some handicraft. If questioned with reference to these and kindred activities, the physiologist would answer that the repeated action of the nerves and muscles in specific functions fits them the better to act in the same functions, and that the effect of the exercise of any function may be stored up so as to increase the facility of the nervous structure to exercise again every similar function. The psychologist would say that any normal act performed under the guidance of an intelligent will leaves, as its enduring result, an increased power to act and a tendency to act again in like manner. Common parlance, which is apt to enshrine its wisdom in proverbs, simply says, Practice makes perfect. Doing, when it engrosses the attention, exerts a reflex influence upon thinking; after it sinks to the subconscious level it

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ceases to exert a helpful influence. The methods adopted in our manual-training schools are, in this respect, much superior to those pursued under the old apprentice system. The master mechanic found it to his interest to keep the apprentice upon one kind of work until a high degree of skill was attained. He used the apprentice as a means to an end,—the end being the production of things that would sell and thus reimburse the master for the time and trouble of teaching his trade to another. The mysteries of the trade were kept to the last for fear the apprentice would quit before the expiration of the time for which he was indentured. No better plan for crushing the intellectual life could have been conceived. The manual-training school, on the other hand, makes the boy, and not the product, the end of its training, the object of chief concern. It seeks not merely to make the man a better workman, but the workman a better man. No pupil is asked to go through the same movement, to do the same piece of work, for the purpose of developing skill, until every trace of interest is gone. Nothing is made for the purpose of selling; everything prescribed is for the purpose of developing the pupil's powers, to enable him to express thought by the use of working-tools and instruments. The working-drawing and the model are the symbols which come nearest to a full representation of the thing to be made. The word, the clay, the stone, the metal, the leather, the cloth, are the materials in which thought finds its final expression. Nothing is carried so far as to deaden the boy's interest in what he is doing; the charm of novelty is kept up from day to day. If the first product is defective, a new problem is set, involving the same fundamental operations, or the use of the same tools and instruments. The manual-training school and the trade school, if properly conducted, thus become a

Apprentices.

Manual training.

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most valuable means for developing the power to think in things. It aims to create the power to think, as well as the power to do; the two are made commensurate and mutually helpful. The thinking is made to issue in doing, and the doing is kept from sinking into the sub-conscious stage, where it tends to degrade the individual to the mere level of a machine. Within these limitations we can endorse Professor Wilson's tribute to the hand, and subscribe to his demand that, as in the days of Israel's glory, it shall be trained in some useful handicraft, not merely as a means of livelihood, but more especially as a means of making the pupil a better thinker, a completer man.

"When I think of all that man's and woman's hand has wrought," says he, "from the day that Eve put forth her erring hand to pluck the fruit of the forbidden tree to that dark hour when the pierced hands of the Saviour were nailed to the predicted tree of shame, and of all that human hands have wrought of good and evil since, I lift up my hand and gaze upon it with wonder and awe. What an instrument for good it is! What an instrument for evil! And all day long it never is idle. There is no implement which it cannot wield, and it should never in working hours be without one. We unwisely restrict the term handicrafts-man or hand-worker to the more laborious callings; but it belongs to all honest, earnest men and women, and is a title which each should covet. For the queen's hand there is the sceptre, and for the soldier's hand the sword; for the carpenter's hand the saw, and for the smith's hand the hammer; for the farmer's hand the plough; for the miner's hand the spade; for the sailor's hand the oar; for the painter's hand the brush; for the sculptor's hand the chisel; for the poet's hand the pen; and for woman's hand the needle. And if none of these, or the like, will

Handicrafts.

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fit us, the felon's chain should be round our wrist, and our hand on the prisoner's crank. But for each willing man or woman there is a tool they may learn to handle; for all there is the command, 'Whatsoever thy hand findeth to do, do it with thy might.'"

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XXI

THINKING IN THE ARTS

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A meagre soul can never be made fat, nor a narrow soul large, by studying rules of thinking.

PROFESSOR BLACKIE.

Have your thinking first, and plenty to think about, and then ask the logician to teach you to scrutinize with a nice eye the process by which you have arrived at your conclusions.

PROFESSOR BLACKIE.

Invention, though it can be cultivated, cannot be reduced to rule; there is no science which will enable a man to bethink himself of that which will suit his purpose. But when he has thought of something, science can tell him whether that which he has thought of will suit his purpose or not. The inquirer or arguer must be guided by his own knowledge and sagacity in his choice of the inductions out of which he will construct his argument. But the validity of the argument when constructed depends upon principles, and must be tried by tests which are the same for all descriptions of inquiries, whether the result be to give A an estate, or to enrich science with a new general truth.

J. S. MILL.

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XXI

THINKING IN THE ARTS

For centuries men have been disposed to look with disdain upon the occupations in which the hands and the body are more concerned than the mind. The arts in which thought predominates were honored above the handicrafts; and it is only in recent years that educators have begun to recognize the educative value of thinking through the hand as we find it exemplified in schools for manual training. A comparison of the various arts will serve to dignify this kind of training and to set it in a clearer light before teachers and boards of education.

Mediæval thinkers divided the arts into two classes, which they called the mechanic and the liberal arts, and enumerated seven arts in each class.

The seven mechanic arts were Agriculture, Propagation of Trees, Manufacture of Arms, Carpenter's Work, Medicine, Weaving, and Ship-building. The primary operations were mechanical, as the name implies, and hence involved a genuine thinking in things. Their number has been greatly multiplied; the operations have grown wonderfully complex; thought upon the activities which they necessitate has led to the discovery of guiding principles, and some have risen to the rank of regular professions. The growth and the care of trees have given rise to forestry. Ship-building and the manufacture of arms involve science of the highest order. The practice of medicine and surgery

Mechanic arts.

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requires skill based upon kinds of knowledge and thinking that are rigidly scientific. The thoughts which have been crystallized in modern inventions deserve equal rank with the thoughts which philosophers have woven into systems. The various trades of civilized society necessitate the expression of thought through the hand. Manufactures and commerce involve transactions, operations, and competition requiring the highest intelligence, the most accurate thinking, the most vigorous effort. Any youth whose training has fitted him to excel in these is sure of work and fair compensation.

The useful occupations.

Far too often the school has taught the pupil to undervalue and even to despise useful occupations. Scientific research, philosophic speculation, and literary productivity have been lauded as more honorable vocations. Any honest occupation that furnishes adequate exercise for man's marvellous faculties is honorable in the sight of God. If two angels should be sent from heaven, one to rule a kingdom, the other to break stones upon the highway, each of them would be happy in the thought that he was fulfilling his divinely appointed mission, and each would receive, upon the completion of his task, the "well done" which will finally be spoken to every good and faithful servant.

In 1840 Harriet Martineau visited the United States and reported only seven occupations open to women,—teaching, needlework, keeping boarders, working in cotton factories, typesetting, bookbinding, and household service. The school has been blamed for causing the rising generation to underestimate the last named in comparison with the other occupations open to women.

Woman in the arts.

When anything goes wrong in American life the school is not only blamed, but also expected to supply the remedy. It must be admitted that there is much false thinking on the subject of household service

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in so-called polite society. A woman may cook for herself and her own household without losing caste. As soon as she becomes the cook in another woman's kitchen she is banished from the parlor of fashionable society. She can stand in a store or work in a factory without losing her place in the social scale; but if she works for hire in the kitchen, she is thenceforth treated as belonging to a lower caste. Is thinking in the culinary art less valuable or less difficult than the thinking involved in selling ribbons and laces? Does the preparation of a palatable meal require less brains and less skill than the setting of type or the making of yarn? Does good cooking add less to the welfare of the race than playing on the piano or painting in oil- or water-colors? The teaching of domestic science is calculated to change public opinion and to add to the sum of human happiness by emancipating the home from the tyranny and the caprices of the servant girl and by securing to deserving help a juster appreciation of efficient thinking in household service.

America has been aptly named the paradise of woman. The American woman is not expected to break stones upon the highway, to carry market-baskets on the top of her head, to pull the milk-cart alongside of the dog, to do all kinds of rough manual labor, whilst strong-armed and able-bodied men have charge of the elementary schools. Fully two-thirds of the teachers in America are women. Her sphere of activity has been greatly enlarged in other directions. She may be the inferior of the stronger sex in original and creative work,—time will settle that question,—but in ability to carry college work and to do practical thinking she has shown herself the equal of her brother and in every respect deserving of the exalted position assigned to her in the New World. She has attained her standing

America the paradise of woman.

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in America through her ability to think and to apply thought in the useful arts.

The liberal arts were subdivided into the trivium and the quadrivium. The trivium, consisting of grammar, logic, and rhetoric, sought to teach the art of thinking correctly, of expressing thought in correct language, and of presenting it in forceful, persuasive discourse.

The liberal arts.

The quadrivium, consisting of arithmetic, geometry, astronomy, and music, was composed of thought-studies, and furnished material for the thinking of generations of the best men. The enlargement of the boundaries of human knowledge has increased the number of studies to such an extent that no student need weep like Alexander because there are no more worlds to conquer. Moreover, in many directions the human race is simply on the border-land of discovery. At the beginning of this century a professor lamented that the age of discovery had passed. The professor who quoted him in the middle of the century could point to the steam-engine, the electric telegraph, and the use of anæsthetics. In the closing year of the century we can point to a record of inventions and discoveries unsurpassed in the thought-achievements of the race. Man has learned to put thought into machines that do work with a speed and accuracy impossible of attainment by the human hand. His thought is changing the face of the earth and developing a civilization based upon a degree of physical well-being and comfort of which the man of the last century had not the faintest conception. To follow in thought the achievements of a single year in the improvement of machinery and the resulting additions to our material wealth is to fill the soul with wonder at the marvellous powers of the race. All is due primarily to the exercise of the power of thought, and sec-

Quadrivium.

Discovery.

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ondarily to the manifold ways of expressing and realizing thought. Never were there such magnificent opportunities for those who have learned to combine thought and action, intelligence and skill, brains and the handicrafts. The tradesman deserves honor and recognition with those who earn their bread by their wits. Both can live the higher life of thought and culture.

The relation of the trivium to the art of thinking is often misconceived. Grammar, logic, and rhetoric furnish valuable food for thought, excellent discipline for the mind, especially for the understanding; but they do not beget the power of thinking in new fields of investigation. Their function is corrective, not creative. Those who hope to learn the art of composition by the study of English grammar are sure to be disappointed. Grammar furnishes the tests and rules by which one may determine the correctness of sentences. It may furnish discipline for the understanding, and thus prove valuable as a means of culture. It utterly fails to produce thinkers beyond the thinking required in the interpretation of language. Parsing, analysis, and diagramming often become a mechanical iteration of set phrases, resulting in mental apathy. Questions in unexpected forms may then be needed to rouse the slumbering powers of the intellect. Trivium.

Homer and Plato wrote good Greek, although neither of them had any knowledge of grammar as a science. Men used correct sentences long before there was a scientific treatment of the sentence.

The same remarks are applicable to the other studies of the trivium. Men's minds obeyed the laws of thought and drew correct inferences long before the science of logic was formulated. He who studies logic in the hope that it will make him an original thinker is doomed to disappointment. Logic has a critical as well as a disci-

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plinary value. Its influence upon the intellectual life is like that of mathematics. It furnishes a test for one's own thinking and provides the means for detecting fallacies in the reasoning of others. Logic can be taught with advantage to those who have learned to think; it fails to make creative spirits who have the power of gathering thoughts, weaving them into a system, and reaching trustworthy conclusions.

Rhetoric possesses great disciplinary value for the understanding. It deserves careful study on the part of those who express their thoughts in public discourse. The moment it becomes an end, instead of means to an end, it defeats its own purpose. To draw the attention to the figures of speech and other rhetorical devices of an oration is to divert the mind from the line of thought and to defeat the purpose for which rhetoric is taught. The studies of the trivium are like the handicrafts in that they serve as means to an end. From one point of view they deserve to be classed with the useful arts; from another it is apparent that they furnish material for thinking quite as valuable as the multitudinous branches of study into which the quadrivium has been expanded.

The arts are sometimes divided upon the basis of use and beauty. From one point of view, as already indicated, the liberal arts may be regarded as belonging to the category of the useful, and thus as forming part of a class distinct from the fine arts. Yet the idea of beauty enters into all that man does. Sooner or later he seeks to adorn his home, his language, everything that he employs in giving expression to his inner life.

Fine arts.

The thinking which lies at the basis of the fine arts has distinguishing qualities and characteristics. The mind may be so completely absorbed in poetry, music, painting, sculpture, and in the other things which make life beautiful that it ceases to be a fit instrument for useful

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living or for engaging in more advanced thinking. The element of feeling predominates in the appreciation of the beautiful. The two factors which enter into the beautiful are the idea and the form. By casting into the alembic of the imagination the materials which the mind gathers from the external world, there is evolved the ideal; as soon as this ideal is found embodied in any form of nature or art the object is called beautiful. The power to see the idea in the form, the ideal in the work of art, is a function of thinking, and deserves attention from those who are teaching others to think.

Æsthetic and scientific studies differ.

Vast is the difference between the æsthetic and the scientific appreciation of nature. The scientist pulls the flower to pieces, analyzes its parts, imposes hard names, and destroys that about the flower which is most attractive to the child and the poet. The student of beauty admires it as it is in its original surroundings. He cultivates it to adorn the garden, the yard, the home, the school-room.

Very much, therefore, depends upon the way in which nature is studied. The study may be pursued to beget habits of observation or to cultivate a sense of the beautiful. It may be studied for the sake of ascertaining the laws which govern the growth of plants, the changes of the seasons, the movements of the heavenly bodies, the forces which give us light, heat, and all else we need for body and mind. When it is studied for the sake of truth and beauty, the effort lifts us into the domain of the higher life.

The higher life.

Why should any portion of our life, as compared with another, be styled the higher life? Because a man's life may abound in some of the activities which are essential to his existence and still fail to realize the end of his existence. Take life on the farm with all its splendid opportunities for the study of nature and of

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all that is attractive in God's universe. Which should be of most account in the education of the farmer's sons and daughters,—mind or money, light or lucre, the soul or the soil, character or capacity for getting riches? The curse of wealth, fame, office, and the like is that, if they become the chief object of one's ambition, they drag the soul into the dust of dishonor, if not the dust of the street.

"If the farmer boy has only been taught how to raise better stock, what will he do when that better stock ranges his farm? Will he be a happier father and a nobler citizen? Will his home life be any less coarse and dull? Will the possession of blooded stock make him any more honest than common stock? If that is all you have taught him, will he not still be a brute among his brutes? Indeed, just so far as you increase his money-making without increasing his true culture and manliness, you increase the probability that he will die a drunkard, his son a spendthrift, and his grandson a pauper. The supreme need is character to guide these resources." *

The farmer boy.

Whilst it is worth while to dignify labor in all the handicrafts by showing the need for intelligent thought on the part of those who follow them, it is of vastly more importance to emphasize the things of the mind, and to show how the ability to think conditions the activities of the higher life and is essential to the full realization of man's being. The relation of thinking to the higher life will claim our attention in the concluding chapter.

The things of the mind.

* Crooker's "Student in American Life," pages 23, 28.

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XXII

THINKING AND THE HIGHER LIFE

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How vastly disproportionate are the pleasures of the eating and of the thinking man! indeed, as different as the silence of an Archimedes in the study of a problem, and the stillness of a sow at her wash. Nothing is comparable to the pleasure of an active and prevailing thought,—a thought prevailing over the difficulty and obscurity of the object, and refreshing the soul with new discoveries and images of things, and thereby extending the bounds of apprehension, and enlarging the territories of reason.

DR. SOUTH.

What is more pleasant than to read of strong-hearted youths, who, in the midst of want and hardships of many kinds, have clung to books, feeding, like bees to flowers? By the light of pine-logs, in dim-lit garrets, in the fields following the plough, in early dawns when others are asleep, they ply their blessed task, seeking nourishment for the mind, athirst for truth, yearning for full sight of the high worlds of which they have caught faint glimpses; happier now, lacking everything save faith and a great purpose, than in after-years when success shall shower on them applause and gold.

BISHOP SPALDING.

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XXII

THINKING AND THE HIGHER LIFE

THE preceding chapter pointed out the function of thinking in the arts, and the reciprocal influence of these upon the power of thought. It remains to point out the relation of thinking to the higher life. The best point of departure for such a discussion is the book which has done more to foster the higher life of the soul than all other books combined. From some points of view the best book on teaching ever made is the Book of books. In it we find not only practical examples and marvellous illustrations of the art of the teacher, but also the most significant maxims and statements bearing upon the development of the inner life. In the account of the Temptation in the Wilderness, we have an utterance from the lips of the Great Teacher, directing our attention towards the higher life. "Man shall not live by bread alone, but by every word that proceedeth out of the mouth of God." (Matt. iv. 4.)

The Book of books.

In the universities one hears a great deal about bread-studies. Knowledge for its own sake, culture for culture's sake, education, not for the sake of its money-value, but for the mind's sake, are the ideals held up before the minds of the students. A world-famous professor of mathematics demonstrated a new theorem, and closed the demonstration with the exclamation, "Now, that is true, and, thank God, nobody can use it!" Does knowledge increase in value as its

Bread-studies.

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utility diminishes? This professor was drawing an annual salary of five thousand dollars, and could well afford to ignore the money-value of an education. Lifted above the struggle for bread, he had no sympathy with the multitudes in whose experience the struggle for bread is the all-absorbing problem of life. The theory of life propounded by the Great Teacher is very different. He did not despise the arts that make bread and win bread. Twice He miraculously multiplied the loaves and fishes, in order to feed the multitudes. For many years He worked at the carpenter's bench, and after the death of His father helped to support His mother. When hanging upon the cross, He intrusted His mother to the care of John, the "disciple whom Jesus loved."

The Great Teacher.

But when Satan came to him and suggested the making of bread by unlawful means, He repelled the tempter, saying, "Man shall not live by bread alone, but by every word that proceedeth out of the mouth of God." Bread here stands for more than physical food. It is symbolic of the life that turns upon what we eat and drink, the garments we wear, and the houses we live in.

The best of French kings cherished it as the ambition of his life to make every one of his subjects so well off as to be able on Sunday to have roast fowl for dinner. Had he lived in our day, he would have included among the objects of his ambition a new bonnet for every woman at least twice a year. Roast fowl and new bonnets cost money; and money indicates the plane from which very many people look at every question of government and education. Money stands for what we eat and drink, for the garments we wear and the houses we live in, for the thousands of creature comforts which we deem essential to our well-being and happiness. Perhaps the school has not done all it is destined to accomplish in fitting the pupils to win these, but there

The French king.

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is abundant evidence to show that a good school increases the earning power of the individual, and thereby makes possible the higher life of mind, or of the soul. The untutored red man eked out a scanty existence in spite of unparalleled advantages in soil and stream and climate; the intelligence begotten by the modern school has enabled our people to utilize and develop the material resources of the New World to such an extent that Carlyle sneeringly said, "America means roast turkey every day for everybody." Let us accept the remark as an acknowledgment that the American people are better fed than those of England or Continental Europe; and yet Carlyle was right in hinting that there is a life higher than that which turns upon what we eat and drink and wear, for this is in accord with the view of life taught by the greatest Teacher of all the ages.

Earning power.

It is worth while to pause a moment for the purpose of pointing out the relation of the higher life to the side of life symbolized by bread. In a word, the higher life rests upon the other as a basis. Where the vital energies of a people are exhausted in the struggle for bread, the very mention of education is a mockery. The school lays the foundation for the higher life when it increases the average earning power of the industrial classes, and thereby makes it easier for them to gain a livelihood. Here is the first point of contact between the school and the higher life. There is no language sufficiently strong to condemn the spirit of the professor who, when he had demonstrated a new theorem in higher mathematics, thanked God that nobody could use it.

The basis of the higher life.

Only professors filling well-endowed chairs at our universities can afford to speak disparagingly of Brotstudien and to advocate theories of education which would sunder the school from practical life. An educa-

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tion that unfits the pupil for bread-winning in case of necessity cannot be too severely condemned; among other reasons, because it fails to lay a proper foundation for the higher life. On the other hand, the school that does not aim at something higher than dollars and cents deserves equally severe condemnation; for that which makes life worth living cannot be bought with money. If you are rich, you may buy a fine house, but you cannot buy a happy home; that must be made,—*made* by you and by those who occupy it with you. With money you may rent a pew in some fashionable church, but you cannot rent a good conscience,—that depends upon your manner of living and dealing with others. Money will enable you to buy a fine copy of Shakespeare, but it cannot purchase for you the ability to appreciate a play of Shakespeare,—that is the result of education. Wealth will enable you to cover the walls of your costly mansion with beautiful pictures; and the sewing-girl, if she has been properly taught in a public school, will get more enjoyment out of them than can possibly be gotten by the sons and daughters of wealth and luxury whose proper education has been neglected.

What money can and cannot buy.

Plato wrote above the door of the academy, "Let no one enter here who is destitute of geometry." Why did he value geometry so highly? Not merely as an introduction to the study of philosophy, for in one of his dialogues he says, "God geometrizes." He had an idea that a youth in thinking the theorems of geometry is thinking divine thoughts. When Kepler discovered the laws of planetary motion, he exclaimed, in ecstasy, "O God, I think thy thoughts after thee!" When a pupil learns to think the thoughts which the Creator has put into the starry heavens above us and into all nature about us, he is

Thinking God's thoughts.

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thinking God's thoughts and tasting the enjoyments of the higher life. When he is taught the right use of books, and given access to a public library, he may acquire the power to think the best thoughts of the best men at their best moments. In nature study, in the reading lesson, in the teaching of science and literature, the school fosters the higher life of the pupil by enabling him to think God's thoughts and man's best thoughts as these are enshrined in creation and in the humanities. The objection is sometimes heard that the school makes the working-classes discontented with their lot. "Teach a man to think," says the opponent of universal education, "and you make him dissatisfied with what he has and knows." If the school fixes the eye upon wealth, fame, glory, official position, and other things which can be attained only by a few, and which, when sought as the chief end of life, resemble the apples of the Dead Sea, turning to ashes on the lips as soon as they are tasted, then, indeed, the school may doom its pupils to a life of discontent and disappointment. But if the school fixes the eye upon the things of the higher life, things which are within the reach of every boy and girl at school, it lays the foundation for a contentment far transcending the possibilities of a life that turns upon feasting, office-holding, and the things that can be bought with money.

The objection.

True contentment.

It must be admitted that the exercise of the higher powers carries with it a certain feeling of discontent, but it is a feeling that conditions true progress and is not doomed to ultimate disappointment. The true test of what is preferable is the testimony of those who have knowledge of both modes of existence. Who that knows both does not value the pleasures of thinking above those of eating? Who would exchange the joy of doing right for anything attainable by the man who, for the

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sake of success, banishes ethics from his business or his politics? "Few human creatures," says Mill, "would consent to be changed into any of the lower animals for a promise of the fullest allowance of a beast's pleasures; no intelligent human being would consent to be a fool, no instructed person would be an ignoramus, no person of feeling and conscience would be selfish and base, even though he should be persuaded that the fool, or the dunce, or the rascal is better satisfied with his lot than they with theirs." "It is better to be a human being dissatisfied than a pig satisfied, better to be a Socrates dissatisfied than a fool satisfied. And if the fool or the pig is of a different opinion, it is only because they know only their own side of the question. The other party to the comparison knows both sides." Who would not rather be an intelligent workingman seeking to better his condition, than an ignoramus contented with little because he knows nothing of the joys of the higher life?

Life's contradictions.

Life is full of contradictions and incongruities and disappointments. Over against these, the school, in its relation to the higher life, has a duty to perform. For the discontent which springs from life's contradictions and incongruities a safety-valve has been given to man in his ability to laugh. The person who never laughs is as one-sided and abnormal as the person who never prays. The comic is now recognized as one form of the beautiful, and the beautiful is closely allied to the true and the good. Without going into the philosophy of this matter, attention may be drawn to the fact that beauty has a home in the domain of art, as well as of nature; that the queen of the fine arts is poetry; that the greatest poet of all the ages was Shakespeare; that Shakespeare's literary genius reached its highest flights in tragedies and comedies; that whilst

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tragedy and comedy are two forms of the beautiful in art, comedy is the highest form of the comic, whilst tragedy is the highest form of the sublime. In teaching us to appreciate the plays of Shakespeare, the school not merely teaches us when to laugh and when to weep, thereby furnishing the safety-valve to let off our discontent and to reconcile us anew to our lot, but puts us in possession of that which money cannot buy,—namely, the ability to appreciate the beautiful in its subtlest and sublimest forms. Who owns the moonlit skies, the millionaire or the poet? Who owns the hills and the valleys, the streams and the mountains; he in whose name the deeds and mortgages are recorded, or he whose soul can appreciate beauty and sublimity? Beauty has a home in nature and in art. It is the province of the school to put us in possession of the beautiful, the sublime, and the comic, for these quite as much as the true and the good belong to the things of the higher life.

Tragedy and comedy.

Beauty.

How about life's disappointments? Higher than the life of thought is the life of faith and hope and love,—higher, because these are rooted and grounded in the life of thought, ripen above it as its highest fruitage and efflorescence. The nineteenth century has been an age of faith. Every scientific mind has profound faith in nature's laws, in the universal efficacy of truth; and, like Agassiz and Gray and Drummond, multitudes of the best minds have made the step from faith in natural laws to faith in the laws which govern the spiritual world.

Faith, hope, and love.

The common people evince a faith almost bordering on credulity in the readiness with which they accept the results of scientific research and investigation. Faith lies at the basis of great achievements. Bismarck declared that if he did not believe in the divine govern-

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ment of the world, he would not serve his country another day. "Take away my faith," he exclaimed, "and you take away my country, too." Whilst no religious test can be applied to those who teach in our public schools, our best people prefer teachers who have faith in the unseen to teachers who lack faith in the truths of revelation. In ways that escape observation, the spirit of faith passes from teacher to pupil, and gives the latter a sense of something to live for and something to be achieved.

Faith begets hope. The hope of glory, of rewards in civil and military life, of immortality on the pages of history, has stimulated to deeds of heroism and self-sacrifice, and will continue to do so to the end of time. The higher life knows of higher objects of hope than these. Immortality on the pages of history is only an immortality in printer's ink. The true teacher wishes his pupils to cherish the hope of an immortality far more real than an immortality in printer's ink; he seeks to implant in their hearts the hope of an immortal life in a world where the soul shall be robed in a body like unto Christ's risen body, which Stephen saw in a vision of glory and Paul beheld in a manifestation of overwhelming splendor.

Immortality.

That which makes life worth living is the life of love. In the thirteenth chapter of First Corinthians, which is a poem, though lacking metre and rhyme, Paul speaks of faith, hope, and charity, and says that, of these three, the greatest is charity, or love, as the Revised Version translates it. Faith shall be changed to sight, and hope to glad fruition, but love shall abide forever. Throughout the ceaseless ages of eternity, love of the truth, as it is in Jesus, —yea, man's love for his Maker and his Saviour, and for the whole glorious company of the redeemed,—will

Love makes life worth living.

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continue to glow and to grow, lifting the soul to ever loftier heights of ecstasy and bliss. A foretaste of this ecstatic bliss is possible in this life. Love of home and country, of kindred and friends, of truth and righteousness, of beauty in all its forms, of goodness of every kind, up to the highest forms of the good, gives life on earth a heavenly charm. Even in this world, the love that binds human hearts, that makes homes and brotherhoods, that issues in deeds of kindness, friendship, and charity, is bringing more happiness to the race than all other agencies combined.

"The night has a thousand eyes,
And the day but one;
Yet the light of the whole world dies
With the setting sun.

"The mind has a thousand eyes,
And the heart but one;
But the light of a whole life dies
When love is done."

The school makes possible the higher life when it teaches the pupil to think. Right thinking puts intelligence into the labor of his hands, increases his earning-power, lays the foundation for his physical well-being, and lifts him above an existence that is a mere struggle for bread. It promotes the higher life by teaching him to think God's thoughts, as enshrined in all His works, and the best thoughts of the best men, as embodied in literature and the humanities. It fits the pupil for complete living by developing in him the power to appreciate the beautiful in nature and art, power to think the true and to will the good, power to live the life of thought, and faith, and hope, and love. Thinking and living.

THE END.

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